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SANE PROTOTYPES OF INSANE MENTAL PROCESSES*

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MUCH direct light is thrown on the nature of insanity by tracing the close connection between sane and insane phases of mind. The whole mental history of the human race shows the facility of transition from normal to abnormal psychic states.

As a matter of fact there are sane prototypes for all the chief insane mental processes. In the first place will be considered the delusions of the sane as the causal prototypes of the false beliefs of the insane. Mankind has always entertained delusions due to ignorance, superstition, love of the marvelous and morbid fancy, or such as have been imposed on the masses by designing leaders for their own selfish purposes. These false beliefs have not been merely formal, but have modified the practical conduct of life and have affected the welfare of large classes. In ancient India the minds of the people were pervaded with delusions, mystic, fatalistic and polytheistic. Later in Egypt the people were in gross idolatry, sacrificing human life to false gods and filled with fanatical ideas of life and the world about them. Still later in Greece and Rome aberrations abounded. There were satyric and bacchanalian orgies and human sacrificial offerings, beliefs in fates and furies, omens and demons, the migration of the human soul into animals, and even Greek and Roman Philosophers were not emancipated from the delusions of mythology and demonol-

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ogy. The mention of historical epidemics of delusions is apropos. For centuries blindly deluded multitudes of crusaders pressed on towards the Holy Land like migrating herds of animals, perishing miserably by the way of hunger and sickness or the sword of fanatical peoples whose lands they invaded. The world has never been free from impostors, false prophets and self deceived fanatics, who have communicated wholesale delusions, which have led multitudes into egregious errors of conduct. Epidemic delusions with violent muscular actions, impelling men, women, and children to prolonged rhythmic movements have existed in India, in Egypt, in Greece and Rome and were also widely known in all parts of Europe as St. John's dance tarantism and flagellantism, and appeared in modified form in England in 1760, in Abyssinia as Tigretier in 1810, in the United States in 1800 as the Barkers and in 1875 as the Jumpers in Maine, to say nothing of sporadic similar instances in most parts of the world of recent years.

Accusatory delusions are most common and characteristic of insanity, and the sane prototypes of them abound in history. Whenever real wrong and suffering exists there is a hue and cry for vengeance, and the accusatory public see guilt in trifles light as air and put innocent victims to death. Thus during the French Revolution the streets of Paris ran red with the blood of those falsely accused. The history of inquisitions in Spain, France, and Portugal, of the martyrs of all ages and of religious wars in general show the incredible cruelties of those dominated by accusatory delusions. For more than a thousand consecutive years men held the delusion that insanity was possession by evil spirits, which they sought to drive out by tortures carried often to the point of death. The delusion of witchcraft, shared for centuries by the majority of mankind, caused the cruel death of more than a hundred thousand persons, and at no very distant date in enlightened New England, with the solemn mockery of judicial trial, worthy inhabitants were condemned and executed as witches.

These accusatory delusions of mankind always seek a vindictive outlet. During the great European plagues delusions of poisoning became widespread with frightful

persecutions of the imaginary poisoners, who thus perished cruelly in large numbers.

An entirely different category of delusions pivoting on self-pride, sexual love and the vainglories of war were rampant during the ages of Knight-errantry with its romantic and absurd aberrations and Don Quixote performances.

Other delusions centered mainly in combined religious and sexual feelings have been communicated ordinarily by some male impostor forming communities or bigamistic colonies, and have appeared in all ages and parts of the world. The rank delusions shared for centuries by relatively intelligent men, who devoted their lives to alchemy and astrology, were arch-prototypes of subsequent delusions in chemistry, astronomy and medicine which have survived from one generation to another only to be relegated to final oblivion; and in the mean time they served to shape the delusions of the insane of their special periods. To such an extent is this true that did there exist a continuous and correct account of insane delusions in all ages it would form a true historical reflection of the chief false beliefs of mankind in general during the same epochs. Did space permit there might be added noted instances of rulers of nations and men high in social, political and financial affairs who have held and acted upon delusions, which have caused widespread disasters, but enough has been said to show that delusions constitute an integral part of human intellection.

Delusions of persecution are common in insanity and frequent also in sanity among those with exaggerated instincts of fear and self-preservation, which lead them to suspect and inflict wrong on others. Such delusions of injury sometimes cause wrongs between classes as well as individuals. Thus anarchists not only have rank delusions, but would if they dared be driven by them to continued homicide. Thus they slaughter the rulers of nations and destroy property and innocent lives under the delusion that wrongs due to general bad organization of society can be righted by violent crimes committed against individuals.

The prototypes of insane hypochondriacal delusions are common. Many persons, for a brief period at least, have delusions as to the state of their health, and strange to

say the greatest numbers of "maladies imaginaires" are found among the more intelligent classes. Physicians well know how real these hypochondriacal delusions are — that they are the support of thousands of charlatans and of a colossal drug trade catering to imaginary diseases with special remedies. In this class of delusions the sane prototype and the insane mental process is identical and neither is to be removed by a simple appeal to reason.

Among the insane false beliefs of self-importance, often with a notion of some special mission, are very common. The sane prototypes of these delusions are always to be found in conceited individuals attempting political or social reforms out of joint with the times, or they appear as Napoleons of finance, convinced that the star of their destiny is in the ascendant, and with presumption equaled only by the crudity of their experience, precipitate ruin on themselves and others. It might be easy to arrange seriatim among the sane, semi-insane and clearly insane a great variety of the exaggerated delusions of self-importance in which the final insane mental process is clearly the outcome of the pre-existent sane prototype. This is markedly the case in paranoiacs developing out of native egotism or other hypertrophied trait of character. In like manner might be arranged gradatim the prototypes of the marked delusions which finally emerge in cases of insanity of doubt. First are those with an inclination to question known as sceptical, then others who argue their doubts, often called Doubting Thomases, and those with plain obsessions of doubt, and finally cases with full blown delusions, doubting perchance their own personality or existence. In this whole category of cases the sane prototypes and insane mental processes develop on identical lines and merge gradually into each other.

Another numerous class of delusions among the insane may be included under the general term of "superstitious," and their sane prototypes have existed from time immemorial and are frequent at the present day. It is enough to mention the delusions of augury, mentempsychosis, miracle-mongering, sorcery, the evil eye and casting of spells, fairies, ghosts, direct personal satanic temptations, mind reading, personal magnetism forcing to crimes, not to mention

spiritualists governing daily conduct by conversations with the dead, or those who ignore physicians and deadly diseases and allow their loved ones to perish while mumbling deluded faith formulae. It would contradict the law of cause and effect if these sane prototypes were not followed by like false beliefs among the insane, who in turn likewise converse with invisible beings, are tempted of the Devil, forced by magnetism to act against their wills, have their thoughts read, and have visits from those who slip through locked doors like the prototypic ghost.

No psychological work could be of greater interest and profit than the historical tracing of the evolution of insane delusions in all ages from their sane prototypes in accordance with degrees of civilization and the nature of the immediate racial environment. It would then be possibe to point at once to the inherited and pre-existent lines of thought on which all delusional ideation takes place, and to refer directly to the sane prototype of the resulting insane mental process. Attention is next directed to extremes of conduct of the insane as modelled after sane exemplars. The most extreme acts of the insane are in the main only a continuaton of the folly, violence and criminal acts common in sanity. Even suicide, regarded by some as proof of insanity, has been practiced everywhere and was regarded by Greek and Roman philosophers as an inalienable right, and carried out by many notable persons. It is regarded by some modern people under certain circumstances as an honorable necessity and with them the harikari knife is an apanage of nobility. Sane suicides outnumber insane suicides. The motives are chiefly the same in either case. The insane suicide simply imagines that like the sane suicide, he has lost his fortune, friends, reputation or whatever in his estimation makes life worth living, and his act for the same reasons is like that of the sane exemplar. What is true of suicide in this regard may be affirmed with equal truth of homicide. Granting the reality of homicidal delusions, of resulting passions, their murderous attempts are practically modelled after sane examplars for the mere blind impulse to kill without provocation or motive is very rare apart from epilepsy. A study of other insane extremes of conduct shows them to be very much like their

sane exemplars. Incendiary attempts may be made by homesick insane, just as boarding school boys sometimes set fire to schools in hopes of getting home or from anger or revenge. Incendiarism by the insane without aim is rare and the term pyromaniac impulse is to ovague as often employed and calls for closer analysis of cases. The term Kleptomaniac is also loosely used, and such insane acts as are implied by it readily fall into categories on study, and apart from dements and paretics the insane steal much like the sane. The degree of honesty habitual in the patient is not as a rule affected by the insanity, except through diminished self-restraint, possibly. It is well known that much tension along this line of morality is apt to reveal a breaking point, and that sane honesty is often to be measured by the degree of temptation.

The careful student of the human mind finds sexual extremes about the same in sanity or insanity. At every stage in history sacred or profane the bestial side of man's organization has shown itself in sexual excesses both natural and unnatural. When such extremes of conduct crop out among the insane it is not so much a specific manifestation of the alienation as a continuation along the same line as in sane exemplars of the everlasting beastly part of man's nature. If study is made in a broad way it is found that the emotions, propensities and impulses of the insane are derived from sane prototypes. Consider for a moment insane manifestations of religious emotions. The self-reproaching melancholiac doomed in his own belief to eternal torments does not invent the doctrine of unpardonable sin, hellfire, and eternal damnation, but accepts it wholemade as a sane prototype fitting his predominant emotion. If it leads to self mutilation is it not in sacred writ "If thine eye offend thee, pluck it out," and is it not in direct accord with the almost universal belief of the atonement for sin by human sacrifice, the same which prompts the Egyptian to cast a loved child in the jaws of a shark, or the Hindoo to make a living sacrifice of himself under the car of Juggernaut, or priests and their followers in all ages to inflict self-tortures short of suicide or fanatics to perform Abrahamic filicides, to say nothing of extreme penances and lenten starvations productive of insanity. Again insane

love of inflicting pain is chiefly a derivative from the innate cruelty of mankind. Witness massacres the world over, martyrs at the burning stake, victims of the Tarpeian rock, gladiatorial contests, bull fights, bear-baiting, prize fights and the instructive records of the Society for the Prevention of Cruelty to Animals. In the matter of appetites there are sane prototypes for all the excesses or perversions found among the insane. Even as to the extreme instance of anthopophagy which has probably occurred a thousand times in sanity to once in mental disease, the question of a savage reversion rather than a perversion of appetite might be raised.

Insane obscenity and profanity is largely continuation of sane bad habit and lunatic extravagance or eccentricity in dress is easily eclipsed in the costume-collections of anthropological museums.

All the doubts, fears, irresistible tendencies and obsessions of insanity exist primarily and prototypically in sanity. What is bred in sane bone, will come out in insane flesh. Let the student of mental disease go to the fountain head of knowledge, and study sane prototypes in order to broadly understand insane mental processes.

Finally the hallucinations and illusions of insanity are a mere continuation of the prototypic sensorial disorders of sanity. Their etiology in the two states is practically alike and is too well known to call for review here. The child at play talking to imaginary persons or the genial author in repartee with the character-creations of his own brain are prototypes of certain insane patients conversing with imaginary beings. In some children this early play of phantasy is very vivid and may even be repeated by the child as reality, and there is then furnished the earliest prototype of insane phantasmagoria.

In fine the perpetual delusions of man, expressive of the workings and longings of his deeper nature, the emotions, propensities and appetites inherited through countless ages and transmitted with irresistible momentum from generation to generation will ever be the prototypes of insane mental processes, which are modified, but never created by the mental disease.

THE CLINICAL USE OF HYPNOIDIZATION IN THE TREATMENT OF SOME FUNCTIONAL PSYCHOSES

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THE treatment of that large group of disorders commonly classed as the psycho-neuroses is sufficiently arduous to warrant the assumption of a receptive mood toward any measure that may increase our efficiency. Broadly speaking the methods most in vogue at present may be divided into those that attempt to influence the waking consciousness, and those whose condition is the hypnotic state. Each method has many successes and not a few failures to its credit. Suggestion and persuasion will accomplish much, but oftentimes seem powerless to reach or at any rate to modify the very mental states one is most anxious to remove. On the other hand complete hypnosis is not always possible, nor even to be attempted; for aside from those few persons who cannot be hypnotized at all, there is a very large class of patients who refuse absolutely to subject themselves to a procedure which for them is full of darkness and mystery. Confronted with this condition of affairs there are many who would gladly utilize any other method, of whatever sort, which is calculated to render assistance. And such assistance, it would seem, is open to us in the hypnoidization method of Dr. Boris Sidis.

Hypnoidization has two things to recommend it, facility of induction and successful results. The technique is simple, there need be no mention of hypnosis, and hence no stirring up of apprehension in the mind of even the most timorous patient; while the effects produced are comparable, in many respects at least, with those brought about through the medium of complete hypnosis. It is not, and perhaps cannot be maintained that in hypnoidization we possess a complete substitute for hypnosis; but so far as a limited experience (some 30 cases) allows of our drawing any con-

clusions we feel that hypnoidization is quite worthy of more attention and study than it has hitherto received.

What then is hypnoidization and what is the psychological state induced thereby? The method according to its originator, Dr. Sidis, is as follows: "The patient is asked to close his eyes and keep as quiet as possible, without, however, making any special effort to put himself in such a state. He is then asked to attend to some stimulus such as reading or singing. When the reading is over, the patient with his eyes still shut, is asked to repeat it and tell what came into his mind during the reading, during the repetition, or after it. Sometimes, as when the song stimulus is used, the patient is simply asked to tell the nature of ideas and images that entered into his mind at that time or soon after."

Many variations of this particular procedure are of course possible, and the one which the writer has found quite generally useful is the following: The patient is first placed at ease by a few minutes' conversation, during which he is instructed regarding what is about to be done. He is then requested to lie upon a couch, the head of which has been placed close to a faradic wall plate. With his eyes closed he is directed to listen to the monotonous vibration of the ribbon rheotome, and to concentrate attention either upon nothing at all or upon the particular idea or group of ideas or images suggested to him by the physician. At the beginning of the experiment the patient may be somewhat tense and ill at ease, but a few minutes suffice to render him relaxed and to place him in the mental state to which Sidis has given the name "hypnoidal." It is during the continuance of this state that one may obtain information valuable for diagnosis, and give suggestions useful for therapeusis.

Since the purpose of this paper is purely clinical no attempt will be made to discuss in detail the psychology of the hypnoidal state. It may be well, however, to mention briefly that the hypnoidal is a mental state which seems to hold its place midway between waking on the one side and sleep and hypnosis upon the other. It presents certain characteristics of all these and may merge into any one of

them. An individual in the hypnoidal state may pass as I have more than once observed into the sleep state, or at another time into a condition similar to, if not indeed identical with hypnosis. There is more or less continuous fluctuation, and while qualitatively the hypnoidal state is always the same, quantitatively it is not so; for different patients and the same patient at different times will present a more profound hypnoidal condition than at others. Thus it is possible to obtain varying degrees of access to the subconscious. A memory or an experience which at one time rises in fragments, will at another appear in its entirety; and again a memory that at one moment does not emerge at all, at another will be very clear and vivid. In the hypnoidal state there is an increase of suggestibility and if one may be allowed the expression, of persuasability as well. By persuasability I mean uncritical receptivity. During a psychotherapeutic conversation one will often notice a certain attitude of criticism and resistance upon the part of a patient, whereas if the same patient be placed in the hypnoidal state, there is voluntary conversation with the physician, yet a greater readiness to give credence to his remarks. For the purpose of psychotherapy it is often useful to place the patient in a condition of hypnoidization during which a greater influence may possibly be exerted upon subconscious mental processes. There is then a more direct avenue of approach to those subconscious factors that are so potent in determining and influencing self-conscious attitudes; for it has seemed to me that the physical and mental relaxation that characterize the hypnoidal state are precisely the conditions requisite for imprinting ideas upon the minds of neurotic patients. Whether and how far this is true will be determined by a wider experience with different types of patients. Some have been particularly receptive in hypnoidization, which they were not in the waking state; others have been very much less so.

The beneficial effects of hypnoidization are to be seen not alone in those cases where submerged, forgotten memories and emotions are operative in the production of mental disaggregation, but also in those numerous instances where

the experience causing the obsessive idea or emotion is well known to the upper consciousness. This is well shown in our cases I and II where the constant struggle of the patients to put down their obsessions was the persistent cause of their continued nervous instability. When however they were put into the hypnoidal state with its broadening of memory, it was possible to bring about a synthesis of their insistent mental states so that the latter were deprived of their recurring automatism. The same synthesis was brought about in cases III and IV where the dissociated state had sunk completely below the purview of the upper consciousness.

The mechanism at work during hypnoidization may be assumed to be that of mental synthesis into the self-conscious personality of the individual. With the production of this synthesis and as a consequence of it there is a change of emotional tone. This, I believe is the most important factor in the case. A mental system which remains automatic and extra-voluntary carries with it a disturbing emotional reaction. In cases I and II for example the recurrence of the obsessive state was not only accompanied, but preceded and followed by a most pronounced emotion of fear, with all of its psychological manifestations. As a result of this the patients were kept in a state of more or less constant psychological disintegration. They were unable to master their emotions.

In hypnoidal states they were made to reproduce their obsessive thoughts and images and then to describe them in words. When this had been accomplished and they had received further assurance and persuasion from the experimenter, although the purely intellectual content of their obsessions remained known to them, the insistent automatic character and disturbing emotional factors had disappeared. In this metamorphosis of emotional reaction we may observe one of the most interesting and useful attributes of the hypnoidal state. With this brief account of the method of hypnoidization and of the nature of the hypnoidal state we may proceed to the synopsis of some cases in which it has been found to be of value.

CASE I. Mr. C, aged 21, of American birth, a

student in one of the larger American universities, came to me complaining of a curious set of obsessions. His family has been noted for intellectual acumen and superiority. They have been educators and literary men for some generations. The patient is himself gifted with not a little poetic talent and has written many verses characterized chiefly by their profuseness of imagery. Temperamentally he is high-strung and physically not over strong. Some two months before coming under observation, while reading a popular magazine in which was an article upon comets, he was suddenly "struck" as he says, by the idea that possibly a comet such as those described in the article might strike the earth, causing an enormous amount of injury and possibly death. This idea which was not very insistent at first gradually became the nucleus around which was constructed a very extensive obsessional system of ideas and acts. The young man has considerable mathematical ability and proceeded at once, in his endeavor to calm his fear, to calculate the precise chance that there was of a comet striking the earth. This calmed him for a time in view of the fact that he calculated such an event was only very remotely possible. He was free however for only a short time from his insistent fear of comets. In pursuance of his endeavor further to relieve his mind he wrote to an eminent mathematician, a friend of his and a professor in a foreign university, asking him to calculate mathematically the chances of the earth being hit by a comet. Upon receiving this calculation he was again somewhat relieved, although not entirely so. Besides calculating mathematically he attempted to assuage his fears by reasoning that even though a comet did strike the earth it would hit only one side and would therefore not destroy all the inhabitants of the globe. Little by little the comet system of ideas became the dominant one in his consciousness and he was unable to study or to pursue any task for long because of the uprush of his obsessional ideas.

When I first saw him he realized the absolute absurdity of his fears, yet he was not able to banish entirely the apprehension that possibly such an accident might occur. For weeks he had been argued with and talked to by his

relatives and his physician, all of whom were unsuccessful in alleviating his mental state. Added to the fear of comets was the other fear that his condition of mind would become chronic and hence incurable, thus leading him step by step into a state of mental disintegration.

A series of association tests was made to determine the probable emotional effect of the comet system of ideas. The patient's average association time for different words was found to be 1.3 seconds. A second series of association tests was then made, with the following abridged results:

Stimulus word	*Re-action word*	*Re-action time*
Philosopher	Zeno	1.2
Astronomy	Earth	1.4
Paper	News	5.0
College	Princeton	1.3
Sleep	Dream	4.1
Poet	Poe	1.6
Brain	Mind	3.2

In this association test there were then three lengthened re-action times. Upon inquiry it was learned that the cause of these lengthened times was this: During sleep the patient had often dreamed of comets. He was afraid that he might some day take up a newspaper and find an account of a comet's having actually struck the earth. Furthermore he was constantly afraid that his brain might become influenced by his obsessional mental state.

He was next placed in the hypnoidal state by means of the method detailed above. While in this condition he was requested to place himself in the actual circumstances under which he first saw the magazine article concerning comets and to describe what came into his mind regarding it. He said that the scene appeared to him with great vividness and, beginning with his picking up the magazine in a drug store, he detailed with great minuteness the course of his thoughts and actions up to the time he came under observation. It was surprising to observe with what detail he was able to recall his thoughts and to explain the origin of his obsessional mental system. During the first minutes

of his narrative he was somewhat emotionally excited, but this emotional disturbance very shortly disappeared and he became calm and relaxed as is characteristic of patients in the hypnoidal state.

Having completed his narrative he was then given an explanation of the origin, the nature and the significance of his ideas. In view of his superior intelligence he was able to comprehend what was said to him with apparently little difficulty. He declared himself after half an hour's treatment to feel much relieved mentally and less disturbed physically, in the sense that he felt less of the nervous bodily trembling of which he complained.

Another seance of hypnoidization was completed one week from the former one and ten days succeeding this treatment he announced himself as being practically satisfied that his ideas were purely abnormal and his fears groundless; therefore, he was convinced of the absurdity of worrying. Since that time he has suffered no recurrence of his acute attack of obsessions.

CASE II. Mr. X., American by birth, 42 years old. Patient has been a victim of the Wanderlust. He has been in all parts of the world and has engaged in numerous occupations. At the present time he is occupied in business in a neighboring city. Some three years ago he first met a young woman, saw her for a few moments and was so impressed with her manner and personality that he became very much enamored of her at first sight. Circumstances rendered it impossible for him to see her again until three years later, when he became very attentive to her and apparently his attentions were received and reciprocated. For four months this state of affairs continued and the patient became engaged to marry the young woman. He was very deeply attached to her and made, as he described it, every act radiate to and from her; she was constantly in his thoughts. One day he called upon her as usual and received a very cool reception which was terminated by her with the assertion that she wished to break her engagement and felt that she could not marry him. The immediate effect of this piece of news was a very severe nervous upset with insomnia, loss of appetite and ambition for some two or

three weeks. During all this time the patient brooded upon his loss and little by little an obsession took hold of him and dominated his consciousness despite his will. He says that it is impossible for him to get the thought of the young woman out of his mind and that he is constantly and incessantly living over again the events that took place upon the evening of the breaking of the engagement. He has lost fifteen pounds in weight and claims that he is absolutely unable to attend to his business, concentrate his attention or to perform any other act requiring mental or physical effort. He has on two occasions contemplated suicide but says that he thinks he would not have the actual moral courage to make an end of himself. The patient acts and looks nervous.

Ordinary conversation and persuasion has been tried with him to no avail. The attempt was then made to influence his mental state during hypnoidization. He was requested to lie quietly, listen to the rheotome and to think of nothing in particular. While in this state there was no subconscious uprush of ideas for at least three or four minutes. He was next requested to place himself in imagination at the time and place of his original misfortune. This he did with great facility. His language was somewhat as follows: "I see myself very plainly going to the house. I am now ringing the bell. Now I am sitting in the drawing-room," all such expressions giving evidence of very vivid recall of his experience. By judicious guidance he was encouraged to recall every part of his experience, particularly those parts of it carrying with them depressing emotional reactions. After the first treatment he was somewhat relieved in mind and was able a trifle better to pursue his daily work. Treatments were continued daily for two weeks when he was discharged at his own request because, as he put it, he felt that he could keep hold of himself and that even if he did think of the girl he would not allow it to make a fool of him.

CASE III. Miss W. aged 36, school teacher and instructor in pianoforte. One evening during the winter she was sitting in front of an open fireplace reading a story. Beside her was a pet cat. For some reason or other the cat

suddenly jumped upon her lap and bit her hand at the base of her thumb. She was very much scared and screamed. The doctor was called, pronounced her wound to be not at all serious and gave a very favorable prognosis. In the course of a short while the cut had completely healed and gave no evidence of local inflammation or other disturbance. There was, however, a pain at the site of her original injury. This pain was at first intermittent; sometimes it would be present with considerable severity, at other times it would be completely absent. She suffered no other inconvenience at this period. Little by little, however, she found that her right arm was becoming somewhat weaker than the left. In attempting to write with chalk upon the blackboard at school she would often, unknown to herself, drop the chalk. She found that playing upon the piano with the right hand was becoming more or less difficult for her. The pain which originally was confined to the ball of her thumb gradually extended up the forearm into the arm and terminated in the neck at the lobe of the ear. There were no spasmodic muscular contractions and nothing objectively to be found in the muscular system, except an appreciable though not severe weakness of the right arm and hand.

The patient had received medical advice and was informed that a nerve had been caught in the scar of the wound and that for any relief it would be necessary to resect that particular nerve. It was with a view to determine upon the nerve to be resected that I was permitted to see her by her family physician. She had never been examined to discover the condition of her general nervous system. When this was done it was found that upon the right side of her body was a complete hemi-anesthesia to all forms of sensation. The anesthesia included the right side of her tongue, the mucous membrane of her pharynx, soft palate and cheek. The presence of anesthesia was completely unknown to her and she was much surprised to hear of its existence. The method of examination precluded the possibility of this anesthesia having been suggested to her by the examiner. The right eye presented a concentric limitation of the visual field for form and a reversal of the color field for red and blue. The reflexes were normal

with the exception of the plantar reflex of the right side which was not elicited. The absence of this reflex may however have been due to the fact that her foot was very cold.

The result of this examination gave a clue as to the probable origin and nature of the pain and weakness in her right arm. She was not able in her waking consciousness to describe, except in a somewhat fragmentary way, the events at the time of and succeeding the cat bite. In hypnoidization however her memory appeared to broaden considerably and she was able to visualize very distinctly the scene of her accident. She went so far as to describe the color of the solution, namely pink, into which the doctor requested her to place her hand. Beginning with the account of her accident and continuing week by week to the time of observation, there was a gradual ascent of the pain in her arm from the ball of her thumb to and including the lobe of her right ear. It was very interesting to observe the absence of pain in her upper arm and ear and even in her forearm during the first part of her description. This pain had been present when she entered the consulting room. As her description proceeded, however, and she began to describe the various disabilities from wihch she suffered the pain became intense and traveled up the forearm and arm as described before.

With the hypnoidal description of her experience completed she was given instruction as to the nature and origin of her pain. She was told that it was purely of functional character, that it was not due to a nerve caught in the scar, that an operation, of which she stood in great fear, would not be necessary; that the power was about to return and would return very shortly in her right arm. She was furthermore instructed to use her arm as though nothing whatever were the trouble with it and to disregard her pain entirely. This she did and at the present time suffers no inconvenience whatever, although for a period of about two weeks succeeding the synthesis of her dissociated mental state she had some weakness and some pain, although neither of these was as great as it had formerly been. So surprised was she at the disappearance of her pain that she has written several notes

to her physician, asking him how it was she could get rid of such an extensive pain merely by recalling to mind the scene of her accident and the events subsequent to it.

CASE IV. Mr. W., aged 29, by occupation clerk. A man of average intelligence not previously known to have suffered from any nervous disorder. Some two years before he came under observation he was the victim of an accident, his wagon having been run into by a train. He himself was thrown from the seat to the ground and for some hours thereafter was either totally or partially unconscious. He was confined to bed for about two weeks. When he got up and attempted to walk around he found that his right leg was in a condition of contracture at the knee joint. It was also subject to a continuous tremor or rather coarse oscillation apparently uncontrollable by an effort of will. The tremor had persisted from the time of the accident to the period of his coming under treatment. Several measures calculated to relieve the tremor had been instituted with rather indifferent success.

He was sent to the writer by his family physician with the idea of receiving electrical treatment which had not hitherto been employed. The case, from the examination made at the time, appeared to be one in which some form of suggestive treatment might be of value; accordingly, without very much conversation upon the subject, the young man was asked to lie upon the couch with the idea of inducing the hypnoidal state. He was apparently in a rather deep hypnoidal condition. During this state he was required to relate his memory of the accident and the events subsequent to it. When this procedure was finished, with his eyes still shut and the rheotome vibrating, he was told that his leg was not the seat of any disease whatever. It was furthermore impressed upon him that his tremor and his contracture were of purely functional origin and signified nothing more than a condition which was perfectly capable of relief. His mind was disabused of any fear of serious organic disease, of which he had been afraid, and he was instructed to walk upon his leg without the use of any cane, which up to this time he had constantly carried. Before leaving the office he was made to walk about the room with-

out a cane and to sit upon a chair with his foot squarely upon the floor. At this time his tremor had disappeared and his contracture had vanished. This state of affairs continued for two or three days when a return of the tremor was noticed. Another treatment by hypnoidization was sufficient to remove this vestige of his original difficulty. After the second treatment he was not seen again but his physician informs me that there has been no further difficulty with his leg and that he is now following his usual occupation.

CASE V. Mr. Y., aged 29, born in America, by occupation florist. This patient came under observation in the height of an acute attack of fear. For almost two years he has been subject to psychasthenic crises of this type and in the interim has been afflicted with the ordinary feelings of incompetency, insufficiency and strangeness. His particular fear is that of fainting. He is afraid to get upon a car for fear he may faint. He is afraid to go into society for fear that he may collapse and therefore, as he says, make it uncomfortable for those he is visiting as well as most disagreeable for himself. He cannot go into his own hothouse alone for fear that when there he may faint away.

The first time I saw him he had been for an hour suffering from a most acute attack of fear. There was continuous blinking of the eyelids, flushing of the face, palpitation of the heart and a general nervousness which precluded his remaining in one position for more than a minute or two. He walked continuously up and down the room, exclaiming, "In a few minutes I will be all right because there is someone here who can look out for me if I should faint." Obviously it would be useless to attempt to convince a man of this sort, suffering from an acute emotional attack, that he should calm himself and disregard his morbid fear. In his waking consciousness he was apparently unable to do either, although he was trying his utmost.

It occurred to me to try the method of hypnoidization in the endeavor to relieve some of his anguish. It was very difficult to persuade him to lie upon the couch because, as he said, when he lay there and listened to the buzzing of the rheotome it might cause him to faint completely. Hav-

ing consented at last he was found to be very nervous and for some minutes it was impossible to obtain any coherent conversation from him. With a little patience, however, he was gradually calmed to the extent that while his fear was still present he lay quietly and in a condition of complete relaxation, which continued as long as the hypnoidal state was in existence. During hypnoidization he was given suggestions directly and persuasion was employed to attempt the alleviation of his extreme emotion of fear. When he was allowed to open his eyes he was very materially improved and confessed that his mental state and his anxiety were much relieved. The improvement was not for long however because a few days later another attack of fear presented itself and this likewise was treated by hypnoidization, with fairly good results.

The method has been continued with some persistency during a period of two months, but it is impossible to say that the fundamental psychasthenic condition has been improved any, if at all. During an acute spell however it is always possible to give him relief from his agony of apprehension by placing him in the hypnoidal state. This in itself is of considerable value because while his general psychasthenic attitude is bearable the acute paroxysms of fear from which he suffers have been really unendurable.

RATIONALISATION IN EVERY-DAY LIFE*

BY ERNEST JONES, M.D.

ONE of the most brilliant results of Professor Freud's researches, and one of the cardinal points of his psychological theory, has been the demonstration that a number of mental processes owe their origin to causes unknown to and unsuspected by the individual. This applies equally to the mentally normal and abnormal, between whom, here as elsewhere, it is so arbitrary to draw a distinction. In my opinion this apparently simple idea is one of most far-reaching significance both to psychology and to the sciences, such as sociology, that must be founded on psychology. This conclusion is based on the view that inquiry, pursued with adequate scepticism, shows the number of such mental processes to be exceedingly great; in fact I would maintain that the large majority of mental processes in a normal person arise from sources unsuspected by him. We are as yet only on the threshold of important discoveries that will surely be made as soon as this principle finds a rigorous application, and the subject opened up is so vast that in these remarks I can do no more than sketch out a few of the directions along which it would seem that fruitful conclusions are readily to be attained.

Although the importance of feeling in the moulding of our judgments, beliefs, and conduct has for centuries been recognized by poets and writers, academic psychology has usually allotted to it a very subordinate position in relation to what may be called the intellectual processes. Of late years, however, more and more recognition has been given to the importance of feeling, until now one may fairly question whether there exist any mental processes in the formation and direction of which feeling does not play a part of the first rank, and the science of feeling-psychology, to which Professor Freud has devoted himself, shews every sign of becoming the only scientific psychology of the future. He has shewn with convincing precision that a number of previously incomprehensible mental processes, such as

* Read at Congress of Psychology at Salzburg, April 27, 1908.

dream formation and certain apparently meaningless and accidental happenings of daily life, are throughout to be explained by regarding them as problems of feeling. He has further shewn that the causes of these mental processes are usually not only unsuspected by the individual concerned, but are repudiated and denied by him when the very existence of them is suggested. In other words there exist elaborate psychological mechanisms, the effect of which is to conceal from the individual certain feeling processes which are often of the highest significance to his whole mind. The complexity and subtlety of these mechanisms vary with what may be called the extent of the necessity for concealment, so that the greater the resistance the individual shews to the acceptance of the given feeling the more elaborate is the mechanism whereby it is concealed from his consciousness. Consideration of this fact from a sceptical point of view should make one entertain the possibility that even among practical psychologists a number of mental processes make take their origin from sources widely different from those commonly given as explanatory of them.

The concealment mechanisms may be studied in two ways. The known feeling processes may be traced from their origin to the changed form in which they appear in consciousness and their effect on associated mental processes thus observed; or a given mental process may be analyzed and its causes traced back to their elementary sources. Study along these lines shews that although the mechanisms in question are both numerous and complex they may from one point of view be grouped into two great classes, according to whether the individual will offer one explanation as to the origin of the terminal mental process or not. In both classes inquiry into the source of the mental process is stopped and the individual regards any such inquiry as superfluous, in the one case because he already has an explanation, in the other case because he thinks one does not exist. As will presently be seen there is no sharp line between the two classes, and in both of them instances may be found of all kinds of mental processes, actions, judgments, memories, beliefs, etc.

The prominent characteristic of the *second class* is

the fact that the individual considers the given mental process to be self-explanatory and regards any further inquiry into its origin as being absurd, irrelevant, meaningless, unnecessary, and above all fruitless. This broadly speaking is the mechanism that prevents the individual from becoming conscious of the source of the mental process. His precise attitude towards the inquiry varies somewhat according to the kind of mental process concerned, and this enables us further to subdivide the class into two.

When a person is asked what was the cause of a given mental process belonging to this class, he may in the first place categorically assert that it was causeless. Such is the usual attitude adopted towards any of the large group of unconscious and accidental occurrences described by Professor Freud in his Psychopathologie des Alltagslebens, under the different sections of Versprechen, Verschreiben, Vergreifen, Zufallshandlungen, etc. If pressed the individual may assert vaguely that they are due to "chance" or "inattention," but it is plain that what he means is that they have no effective cause, and that there is no reason whatever why that particular mistake should have been made rather than any other. Yet, as is well known, psychoanalysis always reveals a precise cause for the occurrence, shewing that only it and no other could have arisen, as indeed might have been anticipated from the general principles of scientific determinism, and this cause is often associated with some of the most intimate of the individual's feeling processes.

The person may in the second place not so much solemnly deny that the occurrence had a cause as regard the question as being foolish or meaningless. The key to the interpretation of this attitude, lies in recollecting the popular illusion that a volitional process is a self-caused one, *i. e.*, has no cause, for it is doubtful whether anyone is entirely free from the taint of voluntarism in feeling, although the heretical nature of the fallacy itself is from an intellectual standpoint plain enough. The mental processes now under discussion are thus always volitional ones, though the volitional element may not always be evident at the time, but may be imported as an after-thought. A beautiful

example of this class, in which the volitional element was prominent at the moment of occurrence, is the classic one given by Adler in which an individual deliberately selected a number under the full impression that there was no mental process at work other than his free unfettered choice; psycho-analysis, however, revealed a complex series of causes which had determined precisely the number chosen, causes reaching into the most intimate part of his mind. Careful consideration of this example shews further that here were two groups of mental processes concerned, first a conscious determination to select a number and secondly the actual selection itself. The former was a volitional process caused by the reading of Professor Freud's book, the second an automatic process caused by the subconscious feeling processes revealed in the psycho-analysis. Yet both groups appeared equally volitional to the individual, the feeling of volition having been extended from the conscious mental process to the automatic one that was associated with it. The same mechanism may be seen in the other cases in which the volitional element is imported as an after thought. If for example a person decides to take a stroll, the actual direction of his stroll may well be determined by various minor influences that pass unnoticed. If later he is asked why he walked down such-and-such a street, the probability is that he will simply answer "Because I decided to." Here also the slightest trace of volitional feeling is utilized to cover other associated mental processes. In a large number of routine acts, performed automatically, the individual adopts the same attitude when questioned as to their cause. Many acts, the cause of which is a reflex obedience to the custom prevailing in his circle, he will regard when questioned as being volitional, the true cause being thus concealed from him. If for instance he is asked why he wears a stiff collar or a tie, he will certainly regard the question as being extremely foolish, though if he is in an indulgent mood he may humour one to the extent of giving some imaginary explanation, such as "to keep warm," "to look respectable," etc. It is quite plain that he does so only to please the inquirer, and to his mind the real and final explanation of the act lies in its obviousness. The fact that he regards the

question as to the origin of the mental process as essentially absurd is evidently because he considers there is no need to search for a cause in an action that he likes to think is volitional, *i.e.*, self-caused.

We thus soon come to a full stop in the case of the ordinary man, but in the case of an observer who has trained himself to introspective analysis we can get this further clue. Such an observer may quite well recognize that there is something behind the volitional process, though he cannot directly detect what it is. If, for instance, he essays spontaneously to choose a number, he discovers that he is not free to choose any number; one number alone comes and not as one of many alternatives; it comes with a certain impulsive force and he has no option but to "choose" this one number. In other words, he can recognize that it comes to him apparently from without, and it is clear to him that it must have been determined by some hidden influence to which he has no direct access. A striking illustration of this mechanism, together with an analysis of the source of the mental process, is described by Professor Freud in relation to his "choice" of the name Dora to designate the heroine of his Bruchstück-Analyse.

Summing up this class of mental processes, therefore, we may say that whenever an individual considers a given process as being too obvious to permit of any investigation into its origin and shews resistance to such an investigation, we are right in suspecting that the actual origin is concealed from him — almost certainly on account of its inacceptable nature. Reflection shews that this criterion applies to an enormous number of our fixed beliefs — religious, ethical, political and hygienic, as well as to a great part of our daily conduct: in other words, the principle above quoted refers to a large sphere of mental processes where we least suspect it. Yet if such beliefs and conduct are to be brought into scientific harmony, it is of the highest importance that the mechanisms controlling them should be made the subject of precise study in a way that is as yet only just begun.

We return now to the first great class of mental processes in regard to which the individual proffers indeed an explanation, but a false one. It is not sharply divided from

the other class we have considered, for there we saw examples in which the individual casually gave an obviously inadequate explanation for an act which to his mind really needed none. Indeed, all possible grades may be observed in what may be called the feeling of a necessity to provide an explanation. On inquiring into the source of this necessity we see that it is only another aspect of the necessity everyone feels to have what may be called a theory of life, and particularly a theory of himself. Everyone feels that as a rational creature he must be able to give a connected, logical and continuous account of himself, his conduct and opinions, and all his mental processes are unconsciously manipulated and revised to that end. No one will admit that he ever deliberately performed an irrational act, and any act that might appear so is immediately justified by distorting the mental processes concerned and providing a false explanation that has a plausible ring of rationality. This justification bears a special relation to the prevailing opinion of the circle of people who are most significant to the individual concerned, and two different groups of false explanations can be distinguished according as they are formed essentially for the individual himself or for him in special reference to the opinions of his circle, or, roughly speaking, according as they are formed mainly for private or mainly for public consumption. The former of these I would term "evasions," the latter "rationalisations"; there is however no sharp line dividing the two.

We may now consider a couple of examples of these. One of the best instances of evasion is the form of religious belief chosen by an individual. Religious belief itself rests of course on far different psychological principles from those now under discussion, but the form of doctrine accepted is another matter. There are a number of arguments used by each sect to support its special view of religion, and as a rule these are as convincing to the members of the given sect as they are unconvincing to the members of other sects. Let us take the case of a man brought up in a close circle, family and otherwise, of Baptists. At the age of puberty he may become a Baptist without thinking twice about the matter, but it often occurs to such a man that it is an

irrational and therefore distasteful thing to hold a belief merely because all his friends do so. He therefore embarks with a great show of reason upon what seems to him to be a critical and dispassionate examination of the evidence for and against Baptism. It need hardly be said that in most such cases an individual is strongly prejudiced in favor of Baptism, and is so deeply persuaded in his subconsciousness of its truth that he is only seeking for the slightest pretext to become an open convert. The matter once settled he then maintains that he has become convinced of the truth of his doctrine by the overwhelming force of the evidence in its favour, and is highly offended if one bluntly says that he believes in Baptism simply because his father did, and he passionately denies this true but inacceptable explanation. The origin of this belief is thus concealed from him by the mechanism of evasion. How different with an individual brought up in a Catholic environment. The same arguments that with the one man proved so efficacious may here be repeated with the most persuasive eloquence and are rejected with scorn as being obviously fallacious. We see here that environmental influence may inculcate a given belief by the indirect way of raising the standard of acceptability of the arguments used in its favour; in other words, by making them appear more obviously sensible and reasonable to the individual. It will be an interesting question for the future to determine how many of our most firmly held opinions in the value of universal suffrage, of representative government, of marriage, institutions, etc., are not similar examples of blind acceptance of the suggestive influence of our environment, fortified by the most elaborate evasions and rationalisations.

As an example of the allied mechanism of rationalisation I will take the current use of valerian as a specific antidote for hysteria. It will be remembered that for many centuries asafœtida and valerian were administered on the grounds that hysteria was due to the wandering of the uterus about the body and that evil smelling drugs tended to drive it down to its proper position and thus cure the complaint. Although these assumptions have not been upheld by experience, nevertheless at the present day most cases of hysteria are still

treated by these drugs. Evidently the operating influence that leads to their administration is the blind response to a prevailing tradition, the origin of which is largely forgotten. But the necessity of teachers of neurology to provide reasons for their treatment to students has led to the explanation being invented that the drugs act as "antispasmodics" — whatever that may mean — and they are often given in the following refined form. One of the constituents of valerian, valerianic acid, is given the name of "active principle," and is administered, usually as the zinc salt, *sugar-coated* so as to disguise its unpleasant state. Some modern authorities, aware of the origin of the treatment, have even remarked how curious it is that the ancients, in spite of their false views about hysteria, should have discovered a valuable line of treatment and have given such an absurd explanation of its action. This continuous rationalisation in the face of the knowledge that the process in the past was irrational is often seen, a well-known example being the Last Supper explanation of the Mass and Communion, in spite of the recognized theopagic origin of the rite, that is to say present day exponents often plume themselves on their superior rational behaviour while performing the identical acts that they deride as irrational in their forefathers. It is difficult to see to what further lengths self-deception can go, once the beaten path of experience and the scientific standard of verifiability are departed from, and yet I hold it probable that many of our beliefs now thought to be beyond suspicion will prove to be just as bizarre as soon as the searchlight of scepticism is turned on them.

My aim in these few remarks has been to illustrate from what diverse sides Professor Freud's principle may be supported and to indicate what a vast field there yet remains for it to be applied over. We are beginning to see man not as the smooth self-acting agent he pretends to be, but as he really is, a creature only dimly conscious of the various influences that mould his thought and action, and blindly resisting with all the means at his command the forces that are making for a higher and fuller consciousness. In conclusion I would point out that future studies in this direction must give us the secret to the formation of opinion

and belief and the methods whereby these can be controlled. This will yield practical help in the knowledge of how best to promulgate ideas that are in themselves inacceptable, for the day is past when psychologists are justified in still sharing the common illusion of manknd that the best way to spread an opinion is simply to state and restate the evidence in its favour under the pious belief that sooner or later it will surely be accepted if only it is true. We now know that that method is not only tedious, but often permanently unsuccessful. There are unquestionably true ideas that mankind has had the opportunity of accepting for two or three thousand years, but which will never be accepted until they are promulgated with the aid of the knowldege now being gleaned by the new school of psychology.

AN EXPERIMENTAL STUDY OF SLEEP*

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CHAPTER XI

Motor Reactions and the Nature of Sleep

BEFORE we conclude the account of the experiments it may be of interest to make a brief statement of a statistical inquiry in regard to our mode of going to sleep. It is usually supposed that the course and mode of our activities are due to voluntary decisions, that they are irregular, changeable with mood and caprice as our whimsical will is. We are free agents and anything we decide to do we can do in any old way; we do it just as we please and it does not matter to us what the course and arrangement be, provided the will wills it so. As a matter of fact we are far more creatures of habit and instinct than of reason and will. This holds especially true of our fundamental reactions, such as the induction of sleep. If we ask the ordinary person on which side he goes to sleep or on which side he falls asleep most comfortably, the question puzzles him at first. At the first blush it seems to him he can go to sleep on either side; it does not matter. When the question is repeated to him and made clear and he begins to think about it, he soon finds out that he has a definite way of going to sleep. Should he try to go to sleep in a somewhat different manner, he would find it very difficult to fall asleep. We have definite ways of reactions which are due either to habit or to the structural arrangement and mode of function of our organism.

Manaceine in studying motor reactions in sleep has found that right-handed people react in their sleep with the left hand, while left-handed react with their right hand. I have similarly experimented on human subjects and could not confirm Manaceine's results. In my experiments on infants I found that in early infancy the reactions in sleep differ but little from that of waking state. The reactions are *undifferentiated*, but I found that later on in the course

* Begun in April-May number.

of the child's development, the motor reactions mostly conform to Pflüger's laws of reflex action.[1] To quote from my notes:

Boy two weeks old; sound asleep. I tickled his left nostril: bilateral reaction, both hands are thrown up at once. When the tickling is more intense or more persistent and prolonged motor reactions in both legs are induced. The same holds true in the case of the tickling of the right nostril, the reactions are bilateral and become more diffused bilaterally, if the stimulus is more prolonged or more intense.

The baby reacted in the same way in the waking state, so that there was no difference in the reactions of the two states.

When the baby is fast asleep, I tickle the right temple, the response is a slight reaction with the left. This is really accidental. On other similar occasions the reaction is of the right hand and sometimes the reaction is of both hands and also of both legs, according to the intensity or to the cumulative effect of the stimulation.

I invariably found that a slight stimulation given the first time produced a reaction, while a second and third stimulation of the same intensity often produces *no* result.

PFLÜGERS LAWS:

[1](I) Law of unilateral reflexes.

If peripheral stimulations cause contraction in only half of the body, the contraction always occurs on the same side as the stimulus, and in general those muscles contract whose nerves arise from that segment of the cord, to which the irritated sensory nerve belongs.

(II) Law of reflex symmetry.

If the effects of stimulating a sensory nerve upon one side extend to the other side, only such motor fibres are called into activity which correspond with those which are already excited on the stimulated side.

(III) Law of unequal contraction on the two sides.

If the contraction is unequal on the two sides, the stronger reflex is always on the side of stimulation.

(IV) Law of reflex irradiation.

(1) When stimulation of a cerebral nerve causes reflex contraction, the motor nerve concerned is invariably either in the same level as the sensory nerve, or it is further downward toward the *medulla oblongata*. (2) When stimulation of a spinal nerve causes reflex contraction beyond its own segment, irradiation always takes place toward the *medulla oblongata*.

(V) The law of three locations of reflex contractions.

Upon stimulation of a sensory nerve, reflexes can occur in only three parts of the body. These are:

(a) at the level of the stimulated nerve.

(b) in parts innervated from the medulla oblongata.

(c) in the whole body.

Boy six weeks old. Tickling of the left ear excites at first movements in the head, in the trunk and then in both hands; when the stimulation is continued, the whole body becomes involved in the reaction, then the left hand is raised. The same holds true in the case of the right ear,—the movements are first in the head, then spread to the trunk, then to the lower extremities, then only to the side specially stimulated. In other words the reaction is at first *diffused* and then only becomes more special,—the hand is raised corresponding to the side stimulated. This mode of reaction holds true both in waking and sleeping states.

Boy twelve weeks old. I observed an interesting phenomenon which may be described as that of *associated movements*. The infant has both hands in his mouth. When one hand is taken away from the mouth the other goes off *simultaneously*, as if an invisible power has pulled it away at the same time.

Boy thirteen weeks old. When he was asleep, I tickled his left temple, he reacted with the left hand. Tickled his right temple, reacted with the left hand again. When the stimulus became more intense and prolonged, he moved his head, left hand, and also the right hand.

I tickled the left foot when the boy was asleep, both hands reacted, the left hand having the start; I tickled the right foot, both hands reacted, the *left* hand having the start again.

Tickled the *left* temple; moved *right* hand; tickled *right* temple moved *right* hand again. *The reaction is indeterminate*,—sometimes it is bilateral and sometimes crossed. The reactions do not conform to Pflüger's law. On the whole *bilateral reactions predominate*.

When the child was asleep, I passed a pencil over the whole length of the left side of his face,—he reacted with the left hand first and then started with both. I passed the pencil over the right side of the face, he threw up both hands, the right having the lead.

Now and then one can begin to observe the manifestation of Pflüger's law. When the child was asleep, I tickled his right foot; he drew away the foot. When the stimulation is slight, the right foot alone reacted; when the

stimuli became summated he also reacted with the right hand. The same holds true, when the left foot is tickled,—on slight stimulations the left foot is drawn away; on continuous stimulation the left hand also reacts.

Reactions of four months' old babies and older conformed more and more to Pflüger's law.

Experiments on older children give results of like character. Boy of seven years; when asleep, I tickled the right side of his face, the right hand reacted; I tickled the left side of face, the left hand reacted. When stimulations became summated or more intense the whole trunk reacted.

In experimenting on adults in the waking state the results are somewhat uncertain. When touching with a moistened object the right side of the face, for instance, and telling the subject to wipe it *immediately*, sometimes the right and sometimes the left hand reacts. One can often observe that when the subject reacts to sudden irritations, Pflüger's law holds good; and sometimes one can observe reactions with the left hand alone, the *right hand being used for more differentiated movements.*

Experiments on adults, when asleep, almost entirely conform to Pflüger's law of reflex reaction, especially is this the case, if the person has his hands free or sleeps on his back. In cases of hypnoidal states and hypnosis, the reactions are somewhat modified. If the subject happens to react with one hand, he *keeps on reacting with it.* Thus when the subject is touched with a wet or irritating object and is told to react, if it be the right side, he reacts with the right hand. If now the left side is similarly stimulated, the *right* hand keeps on reacting *crossing to the left side.* This takes place, even if there is a long series of stimulations,—the subject reacts with the hand he first starts to react with. This may be largely due to subconscious suggestion. I observed similar reactions in very suggestible subjects even in the waking state.

Manaceine's results are not confirmed by me, and still there is some truth in Manaceine's statement. Now I have suspected for some time that if the condition of limitation of voluntary movements is one of the important factors in the induction of sleep, we should expect that it

would not be a matter of indifference on which side we rest. We should expect that, if the right side is the more active, that the limitation of the voluntary movements would be more marked on that side. In carrying on my experiments on children and adults when in their sleeping states, I had occasion to observe that there was a *definite course in the motor reactions*, in the process of falling asleep. There is method in sleep. Some people go to sleep only on their back and find it difficult to fall asleep otherwise, while others who go to sleep on their side and who form the greater majority *always go to sleep on the same side;* there are very few who can fall asleep indifferently on either side. Moreover, my observations have shown me that by far the majority of *right-handed people go to sleep on the right side, while left-handed people go to sleep on their left side.* I further verified this interesting fact by statistical inquiry among my patients as well as among Harvard students. Some of the right-handed people who go to sleep on the right side may after some time turn to their left to change position, while others keep on sleeping on the same side through the whole night. The majority change position, the right-handed to the left and the left-handed to the right. More than *seventy-five per cent of right-handed* people have given records to the effect that they sleep on the *right side* or rather *fall* asleep on that side. Of the left-handed persons, I find only *one* out of *ten* who falls asleep on the right side. One case is specially interesting to quote: "Up to my seventh year I slept on my right side and I was right-handed. At about the age of seven I met with an accident, I was run over by a team and my right side was injured so that I could not use the limbs of the right side. I used my left hand only, I began to sleep on my left side. This I did up to my fifteenth year. I then began to practice with my right hand too and am now ambidextrous. I sleep now on either side. I use both hands."

Some claim that the reason why they sleep on the right side is because of the dreams produced by the pressure of the heart when sleeping on the left; but it is interesting to observe that others sleeping on their left write in their accounts that they cannot sleep on their right side, because

of the bad dreams, restlessness and nightmares produced. Some claim that it is simply a matter of habit, but the very fact that habit should give such a large percentage of right-handed, sleeping on the right side, and of lefthanded, sleeping on their left side, points to a fundamental condition of our functioning activities and mode of rest. This condition we have found in the variability of our consciousness, by the ceaseless variations in the incoming sensory impressions from sense organs, muscles, joints and various other organic activities. The kinæsthetic sensations coming from the motor activities of our muscles and joints are very important in this respect. To bring about a state of rest and sleep, we must have the condition of monotony and limitation of voluntary movements, hence we can well see the reason why right-handed people whose right side is more active limit that side, while left-handed people prefer to limit the left side most active in them. We can also partly account for Manaceine's results, namely that in sleep, right-handed people react with their left hand which remains free as they sleep on the right side, while left-handed people react in sleep with their right hand, because they sleep on their left side. Manaceine's explanation is pointless in referring these reactions to the activities of the right and left hemispheres. According to Manaceine the left hemisphere of right-handed people is fatigued and hence in sleep the right hemisphere and the left hand have the ascendency. This explanation is fanciful and does not agree with facts. For when the experiments are carried out rigorously, *the reactions are found to conform, with the exception of very young infants, to Pflüger's law.*

Thus the experiments and observations made on lower animals, infants, children and adults all point in one direction, they point to the fundamental conditions of sleep, to monotony and limitation of voluntary movements. Taking as my motto the dictum "*hypotheses non fingo*" I strictly followed the logic of facts. Sleep is not so much due to merely cutting off sensory impressions, be they intense or faint, as to the *monotony* of sensory impressions which in fact may even be intense and numerous. It is the invariability of sensory impressions that reduces the organism to the passive state which we experience as sleep.

PART II

THEORETICAL

CHAPTER XII

Cell-energy, Threshold, "Stimulus-exhaustion" and Sleep

WE may advance in a tentative way the following theory which should be regarded as a provisional hypothesis of the causation of sleep.

One of the main characteristics of living protoplasm is its adaptability to the conditions of the external environment. External stimuli give rise to reactions of adjustment on the part of living substance. This property known in physiology as irritability is specially characteristic of all living matter or of what Huxley so aptly describes as "the physical basis of life." Verworn defines the irritability of living substance "as its capacity of reacting to changes in its environment by changes in the equilibrium of its matter and its energy." In other words, living tissue responds to external stimulations with some discharge of energy. The form of the discharge depends on the peculiar protoplasmic structure, according as it is muscle, gland, nerve cell or but slightly differentiated protoplasm, such as amœba or bacterium. The character of the reaction to stimuli depends on the state of organization of the living tissue.

The delicacy of response of living matter to external stimuli has its limit. Very weak stimulations do not call forth any reaction. Living tissue can only be set into activity by stimuli of certain intensity. If the stimulus falls below that intensity, the protoplasm does not react. This holds true of all cells, from the simplest bacterium and infusorium to the most highly differentiated muscle-cell or neuron. The minimal intensity below which the stimulus remains ineffective is regarded as the threshold of stimula-stimulation. As Howell puts it: "A stimulus too weak to give a response with a motor nerve is usually designated in physiology as subliminal; a similar stimulus with sensory nerves is frequently expressed by the equivalent term of subliminal, that is below the threshold, so a stimulus just strong enough to provoke a perceptible reaction is the

minimal stimulus for efferent nerves and the threshold stimulus for sensory nerves." "Exceedingly feeble stimuli" says Landois "are without effect. The degree of intensity of stimulation that originates the first trace of sensation is called the threshold of sensation or the threshold value." The same is more clearly put by Verworn:

"Let us imagine an organism or part of an organism, *e.g.*, a muscle, under conditions in which no stimulus affects it, and let us bring to bear upon it a stimulus, *e.g.*, the galvanic current, which varies in intensity from zero upward and can be graded easily and delicately. Then we should expect the muscle to exhibit phenomena of stimulation, *i.e.*, to perform a contraction, as soon as the intensity is increased above 0. But this does not happen. The intensity can be increased considerably before the muscle performs even the slightest twitch. Only when the intensity has reached a certain degree does the muscle respond with a contraction; from here on the contraction is never wanting, and up to a certain degree becomes more energetic the more the intensity is increased. The stimulus, therefore, begins to operate only at a certain intensity, and this point is termed the *threshold of stimulation*. Below the threshold the stimulus is ineffective; above it the effect increases with the increasing intensity of stimulus. For the different forms of living substance the value of the threshold is very different. Thus, nerve-fibres are put into activity by extremely feeble galvanic stimuli, while *Amœba* demands very strong currents. The same is true of all other varieties of stimuli in relation to the various forms of living substance."

Psychologically we may agree with Stout that "the point at which it (the stimulus) is just indistinguishable,—so that the least increase would make it distinguishable is called stimulus-threshold."

Kulpe's definition is short; "the just noticeable stimulus is technically termed the stimulus-threshold (die Reizschwelle)."

With the increase of stimulations the irritability of the living substance diminishes, the threshold rises. The same minimal stimulus will no longer bring about a reaction, the stimulus must be increased in intensity before any effect

can take place. Perhaps the best account of it is given by Verworn in his "General Physiology."

"If a living object be stimulated by long-continued, oft-repeated, or very strong stimuli, after some time it passes into the condition of fatigue. The general characteristic of fatigue is a gradual decrease of the irritability of the living substance. This is expressed especially in the fact that with increasing fatigue, the intensity of the stimulus remaining the same, the result of the stimulation becomes constantly less.

"We have already become acquainted with some examples of this fact in considering galvanic stimulation. If a constant current of average strength be passed through an *Actinosphærium*, at the moment of making, there begin to appear at the anode marked phenomena of contraction. The protoplasm of the pseudopodia flows centripetally until the latter are drawn in. Then the walls of the vacuoles break; and a granular disintegration of the protoplasm results, which proceeds constantly farther from the kathode during the passage of the current. This disintegration, beginning with great energy, becomes slower and less extensive the longer the current flows, and after some time is at a complete standstill. This means that the living substance of the *Actinosphærium* becomes fatigued in the course of continual stimulation, and decreases in irritability; hence the stimulus, which at first induced pronounced phenomena of disintegration, later produces no reaction at all. *Pelomyxa* is fatigued still more rapidly than *Actinosphærium*. Stimulation for a few seconds is sufficient to make individuals of this genus wholly non-irritable to currents of equal intensity; a much greater intensity is then required to call out the same reaction."

The principle of variability of stimulation is of great importance in the reaction of nerve-tissue. When the stimulus remains invariable, both in intensity and quality, no reaction follows. This is clearly brought out in experiments on nerve-tissue. "The electrical current" says Landois,[1] "exerts its strongest irritant effects upon a nerve at the time of its entrance into the nerve and at the time

[1] Text-book of Physiology.

of its disappearance. In like manner any rapid increase or decrease of the current passing through a nerve has a strong irritant effect. If on the other hand, the current be allowed to pass gradually into the nerve trunk or to disappear, or the current passing through the nerve be gradually increased or diminished, the visible signs of nerve irritation are much less marked. In general, the stimulation is most pronounced the more rapid the current-variation within the nerve, that is the more suddenly the strength of the current passing through the nerve is increased or diminished." This holds true in the case of the nerve, in which as Bowditch has shown there is little or no fatigue; where fatigue is present the principle of variability becomes a factor of the utmost consequence. The principle of variability of stimulation plays a very important rôle in cells in general, and in nerve-cells in particular where fatigue easily sets in and the threshold is raised with the continuation of stimulation and with the successive discharges of cell energy. Variability of stimulation and fatigue influences the fluctuations of thresholds.

It may be well to bring here the recent work of Sherrington in regard to the relation of neuron threshold and the discharge of neuron energy. Sherrington points out that among the characteristic differences between conduction in nerve-trunks and in reflex arcs (where nerve-cells are interpolated, we find in the latter "Irreversibility of direction instead of reversibility as in nerve-trunks, fatigability in contrast with the comparative unfatigability of nerve-trunks," and "much greater variability of the threshold of stimulus than in nerve-trunks." Sherrington points out that "in certain cases, especially in Invertebrata, observation (Apathy, Bethe, etc.), indicates that many nerve cells are actually continuous one with another. It is noteworthy that in several of these cases the irreversibility of direction of conduction which is characteristic of spinal reflex arcs is not demonstrable; thus the nerve net in some cases *e.g.* Medusa, exhibits reversible conduction (Romanes, Nagel, Bethe and others). But in the neuron-chains of the gray centred system of vertebrates histology on the whole furnishes evidence that a surface of separation does

exist between neuron and neuron. And the evidence of Wallerian secondary degeneration is clear in showing that that process observes strictly a boundary between neuron and neuron and does not transgress it. It seems therefore likely that the nexus between neuron and neuron in the reflex arc, at least in the spinal arc of the vertebræ involves a surface of separation between neuron and neuron." "In view therefore of the probable importance physiologically of this mode of nexus between neuron and neuron it is convenient to have a term for it. The term introduced has been *synapse*" "At each synapse there is a neuron threshold. At each synapse a small quantity of energy, freed in transmission, acts as a releasing force to a fresh store of energy not along a homogeneous train of conducting material as in a nerve-fibre pure and simple, but across a barrier which whether lower or higher is always to some extent a barrier."[1]

Assuming then the principle of variability of stimulation of neuron energy and neuron threshold in regard to the liberation of neuron energy, principles advanced in my previous works, we can return to our subject under discussion, namely sleep. We may regard *sleep as a reaction of protoplasm* and as such we may express it in terms of *neuron threshold and neuron energy liberation.*

If a series of stimulations are kept up without variation, the sensory threshold gradually rises and finally the stimuli fall out of consciousness, they fail to awaken the psycho-physiological systems which have responded to the same stimulations before, because of the rise of the thresholds. This psycho-physiological law, characteristic of all tissues and psycho-neural systems, underlies the phenomena of sleep. As the cell or the neuron keeps on reacting to stimulations the disposable physiological energy becomes lowered and there is greater economy in the liberation of cellular or of neuron-energy. The cell or neuron does not respond to the same intensity of stimulus with the same amount of energy. In other words, *the threshold rises.* Should the stimulation keep on acting without variation, both as to quantity and quality, the threshold rises so high that the stimulus can no longer step over the threshold and

[1] Sherrington, "The Integrative Action of the Nervous System."

can no longer call forth any reaction in the cell. We say that the cell or the neuron is fatigued or exhausted. Really *this is not so much due to the exhaustion of the cell as to the exhaustion of the stimulus*, — it is the stimulus that has exhausted itself. Vary the stimulus in quantity or in quality and the cell or neuron reacts once more.[1] We may possibly best describe this general physiological fact of cellular reaction by the term of "*stimulus-exhaustion*." By repetition the stimulus exhausts itself and can no longer call forth a reaction in the cell, although the cell may otherwise possess a large amount of disposable energy.[2]

As far as the particular stimulus is concerned the cell may be regarded as asleep. The stimuli are withdrawn. Putting the same general law in different terms we may say that *sleep is produced by monotony*.

The cell or the neuron may be regarded as a reservoir of energy. With the great biologist, Strassburger, we may describe the cell as "*energid*." Conceived in terms of energy the cell possesses various levels of energy. The

[1] This may be related to the interesting experiments referred to by Sherrington:

"When the scratch-reflex elicited from a spot of skin is fatigued, the fatigue holds for that spot, but does not for the reflex as obtained from the surrounding skin. The reflex is then tired out to stimuli at that spot easily obtainable by stimulation two or more centimetres (half an inch) away. This is seen with either mechanical or electrical stimuli."

(*The Integrative Action of the Nervous System*, Sherrington)

[2] "The singleness of action from moment to moment thus assured is a keystone in the construction of the individual whose unity it is the specific office of the nervous system to perfect. Releasing forces acting on the brain from moment to moment shut out from activity whole regions of the nervous system, as they conversely call vast other regions into play."

"An arc under long continuous stimulation of its receptor tends even when it holds the common path, to retain its hold less well. Other arcs can then more readily dispossess it. A stimulus to a fresh arc has, in virtue of its mere freshness, a better chance of capturing the common path."

"This waning of a reflex under long-maintained excitation is one of the many phenomena that pass in physiology under the name 'fatigue.' Its place of incidence lies at the synapse. It seems a process elaborated and preserved in the selective evolution of the neural machinery. It prevents long continuous possession of a common path by any one reflex of considerable intensity. It favours the receptors taking turn about. It helps to ensure serial variety of reaction. The organism, to be successful in a million-sided environment, must in its reactions be many-sided."

(Sherrington, address British Association for the Advancement of Science, 1904).

main levels of cellular energy have been described by me in former works as *dynamic*, *static* and *organic*.

By *dynamic* energy is meant that portion of energy which the cell can dispose of in its relations and reactions to the stimuli of the external environment.

By *static* energy is designated that portion of energy which is used only for the life maintenance of the cell, both in relation to other cells and to its own molecular constitution. It is the energy requisite to keep up its morphological organization and internal physiological functions.

By *organic* energy is meant the energy contained in the tissues of the dead cell not as yet decomposed into its inorganic constituents.

The levels of cellular energy are not different in kind. They merely represent progressive phases or stages of the same process of cellular activity.

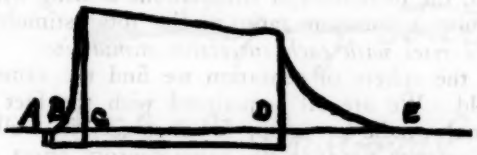
In its relations with the external environment, the cell does not utilize the whole of its dynamic energy. A large amount of it lies fallow, so to say, and remains inaccessible to the ordinary stimulations of the external environment. This amount of unused energy may be termed *stored, reserve energy.*[1] For the cell stores up energy as it stores food, in order to be able to meet the various emergencies that may arise in the course of its relations with the external world. In respect to storing up energy the law of stimulus-exhaustion may be regarded as a safeguard to the cell. The same qualitative stimulus cannot draw more than its allotted portion of energy. If the stimulation continues and attempts to draw more than its share the door, so to say, closes and the stimulus knocks in vain against a locked door. *The threshold rises with each successive stimulation.* When the *maximum* amount is drawn, there is no longer response to that particular stimulus, or rather to say, to that particular qualitative stimulation of a definite intensity. In regard to it the cell no longer reacts, — it is asleep. In order to respond again to the particular stimulus of a certain intensity and quality, the cell must recuperate its special form of energy. When this recuperation is effected, the cell is once more ready to react to the given stimulus.

[1] See my Studies in Psychopathology, Boston Medical and Surgical Journal, 1907.

The liberation of cellular energy in response to external stimuli may be regarded as the *active waking states*, while the restitution or passive rest-states of the cell, during which the threshold is raised and cellular recuperation takes place, may be regarded as *sleeping states*.

From the standpoint of cell metabolism, waking states are correlative with *katabolic* changes, while sleeping states are correlative with *anabolic* conditions. When the cell is active and awake, it liberates energy; when it sleeps, it stores energy. This process of storing up energy is going on all the time to some extent. If a stimulus of a certain intensity and quality keeps on liberating energy, it may arrive after some time at the *maximum*, when the threshold rises so high that the cell no longer reacts.[1] In respect to that stimulus the katabolic, active, waking state ceases and is replaced by the anabolic sleeping states. The cell may thus be awake to all other stimulations, but in regard to the special stimulus it is asleep. We may say that the cell is *asleep partially*. When the liberation of energy has reached the *maximum* point, and the thresholds are raised

[1] "Whenever by a stimulus applied to an irritable substance, the potential energy there stored up is liberated the following phenomena may be observed: (1) A so-called latent period of variable duration during which no effects of stimulation are manifest; (2) A very brief period during which the effect of stimulation reaches a maximum; (3) A period of continued stimulation during which the effect diminishes in consequence of the using up of the substance containing the potential energy—*i.e.*, a period of fatigue; (4) A period after the stimulation has ceased in which the effect slowly passes away.



The curve drawn by a muscle in tetanic contraction, as shown in the diagram, illustrates this phenomenon. Thus, if AD represents the duration of the stimulation, AB indicates the latent period, BC the period of contraction, CD the period of fatigue under stimulation, and DE the after-effect of stimulation showing itself as a slow relaxation. When light falls upon the retina corresponding phenomena are to be observed."

An American Text-Book of Physiology, William H. Howell, Vol. II, p. 343.

in regard to most or to all the ordinary stimuli of the external environment, the cell may be said to be *fully asleep.*

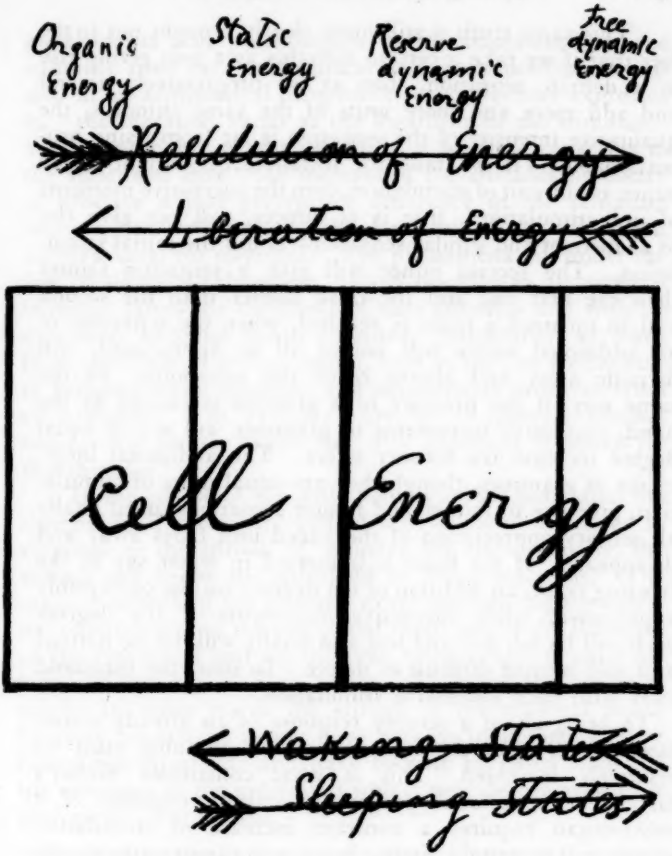
Should however, the liberation of energy by various stimuli keep on and begin to liberate the reserve energy levels and then pass over into the levels of static energy, the cell falls into a *pathological waking state.*

We may represent the relation of the different levels and their correlative states by the following diagram.

What is true of the cell holds also good of systems of cells and neurons constituting a multicellular organism. The condition of monotony and the law of stimulus-exhaustion play a very important rôle in the various changes and adaptations of life-activity. *Stimuli which have exhausted themselves by their monotony drop out and are replaced by new ones until the whole round of stimuli is gone through and the organism ceases to respond to its external environment, — falls asleep.*

The rise of threshold after stimulation holds true in the whole domain of biological activities. If the gastrocnemius muscle of the frog, for instance, is stimulated, say by an electric current, the muscle with successive stimulations responds less readily with contraction and this becomes more evident with the onset of fatigue. Pffefer in a series of extremely interesting experiments has shown that spermatozoids of ferns are attracted by malic acid, the progressive response of the attraction of the cell requiring a constant increase of the degree of the concentration of the acid, the increment of stimulations bearing within certain limits a constant ratio to the total stimulus. *The threshold rises with each successive stimulation.*

In the sphere of sensation we find the same rise of threshold. We are all acquainted with the fact that an additional candle or lamp, for instance, in well lighted room does not produce the same sensory effect as when brought into a more or less dark room. An electric light in the sun is scarcely perceptible. An additional ounce to a lifted pound does not feel as heavy as when raised by itself. A sound added to another sound or to a noise sounds less loud than when appearing isolated or when the same sound is breaking silence. The same relation holds true in the case of other senses.


Organic Energy
Static Energy
Reserve dynamic Energy
Free dynamic Energy
Restitution of Energy
Liberation of Energy
Cell Energy
Waking State
Sleeping State
Pathological
Physiological
Death
Morbid Reactions
Psychomotor Reactions to unusual changes of external environment
Psychomotor Reactions to habitual Environment

This same truth is still more clearly brought out in the fact that if we take a certain stimulus as a unit giving rise to a definite sensation, then as we progressively ascend and add more and more units of the same stimulus, the qualitative intensity of the sensation is far from rising proportionately. If we take for instance, the weight of an ounce as our unit of stimulation, then the successive moments of unit-stimulations, that is of ounces, will not give rise to as distinct and similar sensations as did the initial stimulation. The second ounce will give a sensation fainter than the first one and the third fainter than the second and so on until a point is reached, when the sensation of an additional ounce will not at all be appreciated, will dwindle away and almost reach the zero-point. In the same way, if the pressure of a gramme is excited in the hand, successive increments of grammes will not in equal degree increase the sensory effect. The additional increments of grammes, though they are equal units of stimulation, give rise to fainter and fainter sensations, until finally all sensory appreciation of the added unit fades away and disappears. If the hand is immersed in water say at the freezing point, an addition of ten degrees will be perceptibly appreciated, while successive increments of ten degrees each will be felt less and less and finally will not be noticed and will become difficult to detect. In short the threshold rises with each successive stimulation.

To bring about a sensory response of an already stimulated sense-organ the intensity of the stimulus must be relatively increased. This is what constitutes Weber's law. The continuous progressive sensory response of a sense-organ requires a constant increase of stimulation which within certain limits, bears a constant ratio to the total stimulus.[1] This law is sometimes summed up by

[1] By noting for each strength of stimulus the addition required to evoke a just perceptible alteration of sensation, a series of quantities is obtained expressing the law according to which sensation alters when stimulation is increased. This expression is the so-called "law" of Weber. It says that a given stimulus in perceived less when added to a large than to a small one, or that an addition to a large stimulus is perceived less than an addition to a small one, unless it, relatively to the stimulus, is as great. The "law" may be phrased variously in physiological theory. It may be interpreted as not physiological at all, but psychological. The

physiologists and psychologists in the statement that the stimulus rises in a geometrical and corresponding sensation in an arithmetical progression, or as Fechner expresses it, " the sensation varies as the logarithm of the stimulus." We are probably nearer the truth, if we limit ourselves to the statement that " the increase of the stimulus necessary to produce a just perceptible difference in the sensation bears a constant ratio to the total stimulus." In short, *activity raises the threshold.* The phenomena fall under the law of stimulus-exhaustion. Each reaction to an external stimulus raises the threshold of that stimulus and with its repetition becomes finally excluded, temporarily, at least, from the cycle of *living* stimuli, that is, such as are capable of bringing about reactions and adjustments to the external environment. *The excluded stimulus is ignored, becomes non-existent for the organism. The organism is asleep for that stimulus.*

In the course of the daily activity of the individual the thresholds of sensitivity and of sensori-motor reactions in response to the stimuli of ordinary life rise gradually, the stimuli fall below the threshold of living reactions. The mass of stimuli of the external world constituting the external environment of the individual drops out of the life-cycle of the individual and for the time being ceases to exist for him. *The individual is asleep, asleep for that environment.* In other words the stimuli of the external world by their continuous action have become monotonous, have raised the thresholds and have become excluded from the life existence of the individual who is now deeply asleep for that given environment.

disproportion between increment of stimulus and increment of sensation may take place in purely psychological events and processes. Wundt is of that opinion. He points to the wide occurrence of such a ratio in all psychical activity as outcome of the relativity inherent in every conscious process. Waller finds the response in a nerve trunk directly stimulated, as judged by action current, increase much more nearly directly as the increase of external stimulus than does the response from muscle when nerve is stimulated, or from nerve when retina is adequately stimulated. Waller's evidence seems to point to the law being in part a function of the nerve-cell endings; probably, therefore, applicable to synapses as to motor plates. Delbœuf considers the law an expression of ever-increasing proportion of loss of effect in the central nervous system, due to "fatigue." (Sherrington in Schäfer's *Text-Book of Physiology*, Vol. II, p. 931.)

Should an appreciable variation occur in the environment at about the time when the organism is ready to fall asleep *the external world becomes again a living reality.* The individual becomes alive and wide awake to what is going on around him. If an appreciable change in the total mass or in some stimuli constituting the environment takes place, the individual may be awakened out of his sleep. Should the variation occur in some of the stimuli, their thresholds become lowered and the individual, though asleep in regard to all else, is awake in regard to them. This partial waking state is the soil in which dreams develop most luxuriantly. *We do not dream, when we are asleep, we dream, when we are awake.*[1]

The individual may be asleep to all else and still be awake to special stimuli whose thresholds are very low. The mother watching over her babe, the nurse, the physician attending their patients may be sound asleep to loud noises, but are alive and wide awake to the slightest changes in their charges. They have lost touch with the whole external world, but the ones cared for still have a firm hold on them. High as our bridges are raised for the whole world, they are low for the ones we care for.

Let an appreciable change occur in the stimuli to which we are awake, an amount of energy immediately is drawn from the reserve store, the thresholds barring the entrance to the host of intruders are lowered and we are once more in communication with the external world, — our sleep is gone and we are wide awake. *We can thus be wide awake in the very depth of our sleep.* The possibility of shaking off the grip of sleep under appropriate circumstances and especially the highly significant fact of wakefulness in the very depths of sleep form insuperable difficulties for all those plausible, apparently scientific theories of sleep, theories based on circulation, engorgement, anemia or hyperæmia, narcosis and autointoxication. We can watch in our sleep, count the flow of time and awake at the right moment. The fact that we can sleep and still watch and keep awake in regard to special objects and particular persons shows that sleep is not a matter of blood circulation

[1] My work on dreams will be published in a separate essay.

or of intoxication by accumulation of waste products in the system. Sleep is not a disease, not a pathological process due to the accumulation of toxic products in the brain or in the system generally. Sleep is not of those fatal uncontrollable onsets characteristic of the morbid processes, such as epilepsy, sunstroke, or apoplexy, nor is sleep a sort of narcolepsy. Sleep is not a disease, it is not, as the chemical speculators would have it, a kind of narcosis of the system by the poisons of fatigue products. *Sleep is not pathological, it is essentially physiological in character.* We do not go to sleep, because we are poisoned and wake up when the poisons are eliminated. We go to sleep at our own sweet will and can wake at pleasure. We can wake at any moment and can even be awake in the very depths of our sleep. Sleep is not an abnormal condition, it is a normal state. Like the waking states, *sleep-states are part and parcel of the life-existence of the individual.* Waking and sleeping are intimately related, — they are two different manifestations of one and the same life-process, — one is as normal and healthy as the other. One cannot help agreeing with Clapèrede's biological view that sleep is a positive function of the organism, that sleep belongs to the fundamental instincts. As Clapèrede forcibly puts it: "Le sommeil est une fonction de défense, un instinct qui a pour but, en frappant l'animal d'inertie, de l'empêcher de parvenir au stade d'épuisement: ce n'est pas parce que nous sommes intoxiqués, ou épuisés, que nous dormons, mais nous dormons pour ne pas l'être."

If we look at the matter from a psychological standpoint, we may say that sleep is a *rise of the thresholds of mental aggregates or of moments consciousness.* I have pointed out in a former work[1] of mine that to minimize the expenditure of neuron energy and reach the minimum of consciousness constitutes the tendency of psychomotor life. We can fully realize the importance of this tendency, if we regard it from a teleological point of view. In the struggle for existence or in the economical system of competition of modern life the saving of unnecessary expenditure, where only possible, is of the highest consequence. Organisms

[1] Multiple personality.

that can best effect such an economy of energy will be best fitted to survive. Those organisms that are enabled to reduce to its *minimum* the friction and loss of neuron energy have the advantage of possessing at their disposal a greater amount of energy to cope with new circumstances, with novel conditions, and react better and in a more favorable way when confronted with changes in their environment. This economizing becomes absolutely indispensable in the life-existence of higher organisms, the environment of which is highly complex. *The reduction of psychomotor activity to the least amount of psychophysiological expenditure, in other words, to the minimum of consciousness is the law of psychomotor life in general and of the highest representatives of that life in particular.*

I have further pointed out in the same work that this economizing is by no means an endless process, there is a certain minimum of consciousness beyond which psychic states cannot pass. This minimum of consciousness once reached, must remain stationary, for a fall below it is the arrest of the activity of the mental aggregate. In other words, there is a certain minimum below which consciousness cannot be reduced with impunity. Reduce the consciousness of the total psychic aggregate by lowering the sensibility of its constituents and the whole mental system will cease to function. Now under the conditions of monotony and limitation of psychomotor activity the *moment-threshold rises until the psychic minimum vanishes and the organism is asleep.*

Putting the matter again in teleological terms we may say that we go to sleep when we relinquish our hold on the relations of our external environment. We fall asleep when our consciousness is fagged, when we wish no longer to enter into communication with the external world, when we lose interest in our surroundings. When our interests in external existence fags and fades away we go to sleep. When our interests in the external world cease we draw up the bridges, so to say, interrupt all external communication, as far as it is possible, and become isolated in our own fortress and repair to our own world of organic activity and inner dream life. We fall asleep when the vital interests

in external being have fallen into the background of consciousness; we awake when those interests are aroused. When the struggle for existence ceases we repair to our castle and battlements. Sleep is the interruption of our intercourse with the external world; — it is the laying down of our arms for a respite in the struggle of life. Sleep is a truce with the world. When all psychomotor reactions to the stimuli of the external environment cease, we sleep. We sleep, because we are no longer interested to take an active part in the battle of life. From a teleological standpoint we may say that sleep is a dismissal of the external world with all its vicissitudes, troubles and pains. We cease to desire, we cease to react, and we sleep and dream in peace.

And when evening descended from heaven above,
And the earth was all rest, and the air was all love,
And delight, tho' less bright, was far more deep
And the day's veil fell from the world of sleep,

And the beasts, and the birds, and the insects were drowned
In an ocean of dreams without a sound;
Whose waves never mark, tho' they ever impress
The light sand which paves it, consciousness.

—*Shelley.*

Chapter XIII

Motor Consciousness and Sleep

THE condition of limitation of voluntary movements plays an important rôle in the induction of sleep states. This is due to the fact that motor consciousness not only forms the main body of our mental activity, but also that ideo-motor life is more subject to changes from slight stimulations than is our purely sensory life. Motor elements are highly plastic and modifiable; they enter readily into ever new combinations. From a biological standpoint one can realize the importance of the great modifiability displayed by sensori-motor and ideo-motor elements, since in the adaptation of the organism to its environment it is these elements that are mainly employed in reaction to stimuli of the external world. From the standpoint of adaptation a slight difference of sensory experience may give a widely different and highly complex motor reaction.

Psychomotor processes form the most important and largest portion of mental life. With the exception of man, all the representatives of the animal kingdom, from the lowest to the highest forms, represent but different stages in the evolution of sensori-motor life. The great majority of mankind still leads a life closely allied to animal sensori-motor states. Instance the delight of children in their plays, and the all absorbing interest of college students in their baseball and football games. Even in the highest and most developed forms of mental activity motor ideas and representations are by far the most predominant. Without motor elements ideational life is arrested. It is these sensori-motor and ideo-motor elements that constitute the " stream, the flow, the current " of our mental life. Motor elements enter freely and easily into combinations with all other elements of mental life.

This ease and high plasticity of ideo-motor elements is specially well brought out in hypnosis. Sensori-motor and ideo-motor suggestions are taken before purely sensory suggestions; paralysis, catalepsy, contracture, all kinds of

motor and kinæsthetic illusions and hallucinations are easily induced even in the very light stages, while it is only in the deeper stages that changes of ideo-sensory elements can be brought about. The induction of purely ideo-sensory illusions, hallucinations or delusions, positive and negative, can only be effected in the very deep stages of hypnosis. The freedom in forming new combinations and associations makes the suggestion of motor ideas and representations highly effective.

Throughout the scale of animal life, from the lowest to the highest forms, intelligence is intimately related to the degree of development of the muscular system and to the delicacy of motor adjustments. Among the lower forms of life the Cephalopods are well equipped with powerful muscular arms capable of executing a great variety of vigorous movements. Now the Cephalopods also possess a more highly developed nervous system with a higher grade of mental functions than the rest of the Mollusca. The great activity of ants and bees is notorious and their instinctive psychic life is the richest among the Arthropoda. Note the great variety of motor adjustments of the beaver and also of the intelligence that goes along with it. Birds possessed of a high degree of activity and motor adaptability are also the most intelligent of their kind, such for instance as the different species of talking birds. Notice the activity and great agility of the fox and also the unusual cunning for which the animal is so celebrated in song and fable. The suppleness of the dog, his quick reactions to stimulations, the resources of his motor adjustments and the great extent of his modifiability under changing conditions are all well known and along with them goes a high degree of mental activity. Of all the Mammals the Quadrumana are the most active, the most imitative, and with the exception of man, they are also the most intelligent. When we come to man we cannot help admiring the high complexity and extreme delicacy of his motor adjustments. Most marvellous however is the human hand, that divine organ which gives shape and form to works of art, to all outward visible manifestations of civilization. The great artists and thinkers of antiquity held the human hand in

great veneration. One of the great Greek philosophers did not even hesitate to declare that man's superiority over the brute was due to his hand. Finally in the wonderfully delicate motor adjustments of speech we find clearly illustrated the intimate relation between motor and psychic activities.

Experiments prove the same truth of the importance of motor elements in our mental life. If a series of syllables or numbers is given to memorize, after one reading, five out of ten can be remembered, though with some difficulty; but if the syllables or numbers are written down at the same time, though not looked at during the writing, a far greater percentage such as six or seven syllables can be remembered. If the motor elements in a train of ideas are suppressed, the order of the series becomes confused and even totally destroyed, showing that the motor ideas are important links in trains of association of ideas. *Motor elements form the nucleus of consciousness.*

Biologically regarded, voluntary activity, will, is the power of the organism to adjust itself to the conditions of the external environment. In its last psychological analysis voluntary activity, will, consists of ideo-motor elements, of various modes of adaptations. Will, consisting of kinæsthetic elements, constitutes the active subject of personality and individuality. If this be realized, then the vital importance of motor consciousness cannot be too highly overrated. *Motor consciousness is at the very heart of personality. We are what we can accomplish.* Extreme variability and adaptability of reactions to environment are the main characteristic traits of intelligence, will, personality.

The readiness of psycho-motor elements and group sto enter into ever new combinations gives rise to the formation of a great wealth of associations which help to make the labile psycho-motor groups and systems easy of recall. In fact it may be said that *the ease of recall is proportionate to the mass of associated kinæsthetic elements.* The great modifiability and variability of systems of motor elements requisite in the adaptation of the organism to the varying conditions of life, to its environment, make the ever greater

instability of motor elements an imperative necessity in the struggle for existence.

Forming the predominant elements, both as to intensity and mass, of the most complex, relatively stable, though ceaselessly shifting groups and systems, constituting the highly developed organization of mental life, the motor elements, presentative and representative, are also the first to become involved in the process of dissociation. In the various forms of nervous and mental diseases, under different conditions of intoxication and auto-intoxication, in the traumas caused by shock, physical and psychic, the delicate movements of adjustment are the first to become affected; dissociations of systems of motor elements are first to occur.

The instability of psycho-motor elements may be brought in relation with the fact of the early affection of muscular and kinæsthetic sensitivity and with the predominance of sensori-motor over purely sensory symptoms, so frequently occurring in the course of nervous diseases. With this may be correlated the significant fact referred to by Mosso that "all substances which slowly destroy the organism must produce phenomena analogous to those of curari since the motor nerves. . . . have less vitality than the sensory." It may also be observed in passing that cellular kinoplasm with the "kinocentrum," the centrosome and its archoplasmic structures, possibly the most primitive organoids of the cell, similarly manifest a high degree of variability and instability.

Motor elements may be regarded as the labile constituents of consciousness; — they become easily and frequently dissociated and dropped into the subconscious; but for that very reason they are also very easily reproduced or regenerated. In this respect motor elements follow the general biological law of organic regeneration: Organs that are easily and frequently lost in the struggle for existence are also easily regenerated, as for instance, the legs and claws of Crustacea or the tentacles of the starfish and the octopus. Dissociated systems of motor elements often become regenerated and under pathological conditions, when synthesis is impossible, they may recur with great persistence giving rise to the most uncontrollable types of

insistent ideas and impulses and to various forms of so-called "psychic epilepsy," especially of the motor type, closely mimicking typical organic epilepsy. Such dissociated, subconscious systems, like rudimentary, aborted organs, the appendix, for instance, may often prove very injurious to the organism. The recurrence of such subconscious, submerged, dissociated systems has its parallel n the biological phenomena of reversion or atavism.

The fact that psycho-motor elements enter easily into combinations and form extensive associative systems, makes them easy of recall and hence persistent in memory. From an educational standpoint one realizes the importance of this fact. Children learn things best not by abstract notions, not by looking at objects and hearing of things, but by acting out whatever is taught them. Motor consciousness is more vital than sensory. In the training of the mentally defective the best method followed is that of motor instruction, — to get at the meaning of things by means of action, even if it be automatic at first. As a matter of fact even the normal and well balanced mind gets at the meaning of things by handling them, by having the attributes and qualities of the objects and processes to be learned acted out. *Acting forms the greater part of man's life.*

Forming as motor consciousness does the very heart of mental activity, we can well realize the paramount importance of the condition of limitation of voluntary movements. By limiting the motor activity of the organism we impoverish its mental processes and lower the heart-beat of mental life. The active nucleus of psycho-motor reactions becomes passive, the organism becomes disabled in its response to the stimulations of the external environment, the thresholds rise and the organism is no longer in relation with the external world. When motor activity with its concomitant motor-consciousness becomes lowered, restricted, and fades away, the organism becomes necessarily passive and passes into sleep.

Thus monotony and limitation of voluntary movements work in one direction, — they tend to raise the thresholds of psychomotor reactions, they coöperate in the induction of sleep. These conditions are usually brought about natu-

rally in the course of the daily or nightly life activity of the individual organism, or the conditions may be produced artificially. In both cases the result is the same, — the organism falls asleep. In the life of higher animals the two cases may often combine. When the individual has fagged out his life interests in his active relations with his surroundings, when the stimuli have become monotonous to him and his activity with its correlative motor consciousness has become limited and lowered, he makes artificial arrangements for the intensification of the conditions of monotony and limitation of voluntary activity. He seeks for a dark nook, closes his eyes to exclude as much as possible all extraneous disturbing stimulations and tries to lie down quietly and comfortably, restricts his voluntary movements, breaks his connection with the external world and goes to sleep. *The organism falls into sleep, when the thresholds rise, wakes and rises when the thresholds fall.*

Looked at from a purely physiological standpoint and expressed in terms of energy, of the "cell-energy," sleep may be regarded as the onset of fatigue, as the onset of exhaustion of the levels of dynamic energy in response to external stimuli. The law of stimulus-exhaustion comes here into play as we have indicated in our discussion of cell-energy. Each particular stimulus has its maximum amount of energy which can be drawn upon, under ordinary conditions of daily life. As the special stimulus approaches its limit, it works under greater and greater difficulties, draws less and less energy and finally ceases to awaken any response,— the threshold is raised to its maximum and the organism, as far as that special stimulus is concerned, is no longer awake,— the organism is asleep. In the course of its daily activity the same takes place in regard to most of the objects, to most or to all of the stimuli that constitute the external world of the organism. The stimuli of the external world have drawn all that was permitted to them on their bank accounts, so to say, and the account for the time being is closed. Nothing more is permitted to go out. No stimulus of ordinary life is permitted to draw over and above a certain amount. There must always be ready capital for unusual situations, for emergencies. When the stimuli have drawn their due

and the organism is left with its reserve energy, — liberation of energy with its accompanying waking states ceases. The organism is no longer awake to the stimuli and is asleep.

As in the waking states the katabolic processes predominate, so in sleep the reverse processes, the anabolic, take the upper hand. The organism begins to recuperate its losses and fills up the accounts drawn upon by the stimuli of the external environment, when in active relation with them. With the increase of the income of energy the raised thresholds begin to fall until a point is reached when the stimuli once more overstep the lowered thresholds and once more gain access to the stores of life-energy, — the organism awakes and enters into active relations with the external environment.

Regarded then from various standpoints, sleep is a rise of moments-thresholds under conditions of monotony and limitation of voluntary movements. In this respect sleep strongly contrasts with hypnosis. In hypnosis the individual is specially accessible to any kind of suggestions coming from the external world, the psycho-motor reactions are greatly lightened and are released by the suggestion or external stimulus with great facility, far greater than in the waking state. This great facility is often expressed by the statement that in hypnosis the inhibitions are removed. What specially characterizes *hypnosis is the fact of fall of thresholds* present in individuals, with a predisposition to states of dissociation; in sleep, on the contrary we have found from our study, the general characteristic is the *rise of psycho-motor thresholds*. In passing from the waking state into the subwaking hypnoidal state the individual may either pass into hypnosis with its dissociated states and lowered psycho-motor thresholds or may go into sleep with raised psycho-motor thresholds. *The process of redistribution of thresholds takes place in the intermediary, hypnoidal states. When the redistribution of thresholds in the hypnoidal states brings about a fall of thresholds due to predisposition to and further cultivation of dissociations, the result is hypnosis; when the redistribution in the hypnoidal states brings about a rise of thresholds, the result is sleep.*

Biologically regarded, sleep is as much an instinct as hunger or sex.

Phylogenetically and ontogenetically, the sleep-states of higher animals are developed out of undifferentiated, intermediary, subwaking, hypnoidal-like states found in the resting states of the lower representatives of animal life. The hypnoidal state is the primitive rest state out of which sleep arises. Briefly put, the hypnoidal state is the germ of sleep.

Physiologically and psychologically regarded, sleep is an actively induced passive state in relation to the external environment; the psycho-physiological systems have their thresholds raised in relation to external stimulations; the rise of threshold is induced by a mass of impressions possessing little or no variability, by limitation or by relative withdrawal of stimulations, or what is the same, by monotony of stimulations and by limitation of voluntary movements.

ABERCROMBIE, Inquiries.
ACHASHEFF, K., Kasuistik Narkolepsii. Med. Sbornik, Warsaw. 1896.
ACKERRMAN, Versuch einer Physischen Darstellung der Lebenskrafte.
BALDWIN, Senses and Intellect.
BALLET, Sommeil Pathologique, Rev. de Med. 1882.
BARTHEZ, Nouveaux Elements de la Science de l'Homme.
BAUCHARD, Lectures on auto intoxication in Disease.
BENJAMIN, Uber den Schlaf Allg. Z.f. Psyciatrie. 1898.
BERGER & Loewy, Etat des yeux pendant le sommeil, J. de l'Anat. 1898.
Etat des yeux pendant le sommeil, Int. des B n. 1902.
BERGSON, Le Rêve, Bull. Inst. Psych. int. Mai. 1901.
BERNARD, Cl. La Science Experim. 1878.
BIGELOW, Mystery of Sleep, Harper. 1897.
BINNS, Anatomy of Sleep. 1843.
BINZ, Ueber den Traum. 1878.
BLODET, Observation de sommeil lethargique. Gaz. hebd. October, 1864.
BLODGETT, A. N., A Case of Narcolepsy. Am. J. of Med. Sc. August, 1906.
BOIRAC, La Veille continee dans le sommeil.
BORGHERINI, Schlafähnlicher Zustand bei Thieren, Neur. Centrb. 1891.
BOUCHARD, Leçons sur les auto intoxications. 1887.
BREISACKER, Zur Physiologie des Schlafes Du Boi's Arch. 1891.
BREUER UND FREUD, Studien ueber Hysterie.
BRODIE, BENJAMIN, Psychological Inquiries.
BRODMAN, Plethysmographische Studien am Menschen, J.f.Ps. & Neur. 1902.
BROWN, Compound Fractures of Cranium, Am. J. Med. 1860.
BROWN SEQUARD, Leçons sur les nerfs vaso-moteurs. 1872.
Le sommeil, Arch. de Phys. 1889.
BRUNELLI, Il letargo. Riv. ital di Sc. nat. 1903.
BURDACH Physiologie.
CAMP, CARL D., Morbid Sleepiness, The J. of Abnormal Psych. May, 1907.

Camuset, Apropos de la narcolepsie, Gaz. de Hop. 1880.
Cappie, J., Causation of Sleep.
The Intracranial Circulation.
Carpenter, Physiology.
Charcot, M., Attaque du sommeil, Gaz. de Hop. 1888.
Chavigny, M., Narcolepsie, Soc. Med. de Hop. de Lyon. 1904.
Chesley, Does the Mind Ever Sleep?
Claperede, Ed., Esquisse d'une Theorie Biologique du Sommeil. Archives de Psychologie, February, March, 1904.
Corning, Brain Rest. N. Y. 1885.
Cousins, Ward, A Case of Profound Sleep, Med. Times. April 18, 1863.
Cox, Sleep and Dream.
Czermak, J. N., Nachweis echter hypnotischer Erscheinungen bei Thieren.
Czerny, Z. Zur., u. c. entniss des phys. Schlafes, Jahrb. f. Kindheilk. 1896.
Daddi Sulle alterazioni degli el. d. sys. ner. nell insonnia experim. Riv. di Pat. ner. e ment. III.
Dana, On Morbid Drowsiness, The J. of Ner. Men. Dis. 1884.
Danilewsky, Ueber die Hemmungen, Pflüger's Archiv Bd. XXIV. 1881.
Recherches physiologique sur l'hypnotisme des animaux.
Beobachtungen und Versuchen uber hypnoti Zust. bei Thieren, Pflüger's Archiv. 1873.
De Beer, Der Schlaf der Fische, N. Wien. Tag. 1895.
DeBoeck & Verhoegen, Contr. à l'étude de la circ. cereb., J. de Med. Bruxelles,. 1890.
Delboef, Le Sommeil et les rêves.
Demoor, La plasticicitedes neurones et le méchanisme du sommeil, Bull. de la Soc. d'Anthr. de Bruxelles, XV. 1896.
De Sanctis & Neyroz, Exp. Invest. conc. the depth of sleep, Ps R. 1902.
Die Träume.
Devaux, E., Theorie osmotique du sommeil, Arch. Gen. de Med. 1906.
Dickson, Essays on Sleep.

DIDRICHSON, V. K., K voprosu o nervnoi bessonnitsi.
DRSDOW, V. J., Morbus hypnoticus, Arch. f. Psych. u. Nervenkrakheiten, Bd. 13.
DUBOIS, R, Etude sur le méchanisme de la thermogénèse et du sommeil Ann. de l'Univ. de Lyon XXV. 1896.
Le centre du sommeil, C. R. Soc. Biol. 1901.
Sommeil naturel par autonarcose carbonique, C. R. S. Biol. 1901.
DUGAS, Le Sommeil.
DURHAM, The Physiology of Sleep, Guy's Hosp. Rep. 1860.
DUVAL, Théorie histologique du sommeil, Soc. de Biol. 1895.
EDWARDS, J. Report of a case of Somnolency, Lancet V. I. 1884.
ERRERA, Le méchanisme du sommeil, Bull. Soc. Anthr. Bruxelles. 1895.
Pouquoi dormons nous? Rev, sc. July, 1887.
Théorie toxique du sommeil, Soc. de biol. 1891.
EWEN, A Case of Narcolepsy, Bost. Med. and Sur. J. June, 1893.
FECHNER, Elemente der Psychophysik.
FERE, CH, Le Sommeil paraxystique, Semaine Medicale. 1893.
Crisès de courbature, Annales Med. Psych. 1888.
Note sur l'apathie epileptique, Rev. de Med. 1891.
Note sur la narcolepsie epileptique, Rev. de Med. 1898.
FISCHER, F., Epileptoid Schlafzustande, Arch. f Psych u Nervkr. Bd. 8.
FLEMING, Note on the Induction of Sleep, Br. & For. Med. Rev.
DE FLEURY, Grands symptômes neurasthéniques.
FLINT, Text Book of Physiology.
FOOT, A. W., Narcolepsy, Dublin J. of Med. Sc. V. 82.
FOREL, Der Hypnotismus.
Observations sur le sommeil du loir, Rev. de l'Hyp. 1887.
FORNERIS, Du Role de la Glande thyroide, Gazette Sarda. 1858
FOSTER, A New Standpoint in Sleep Theories Am., J. of Psych. 12. 1900.
FRANCOSCHI, F., Il sonno patalogico, Riv. di Pat. ner. e mentale V. 9
FRANCK, Recherches sur les mouvements du cerveau. J. de l'anat. 1877.

Freud, Ueber den Traum.
Friedman, M. Ueber die nichtepiletischen Absencen, Deut. Arch. f. Nervenheilk. 1906.
Gairdner, British Med. Jour. Oct. 30, 1875.
Galton, Inquiries.
Gay, J., Sleeping Girls. Lancet. July 3, 1880.
Gelieau, De la narcolepsie, Gaz. de Hop. 1880. Las
Gilbert, J. A., Loss of Sleep, Am. Medicine, IX, 1902.
Gilles de la Tourette, Des attaques du sommeil hysterique.
Girondea, De la circulation cerebrale.
Haffner, Schlafen u. Traumen.
Hagen, Psychologie und Psychiatrie.
Hammond, On Sleep.
Hanseman, Unters, ueber d. Wintershlafsorgan, Engelm., Arch. f. Phys. 1904.
Hartley, Observations on Man.
Hayman, Sleeping Girl of Turville. Lancet. June 12, 1880.
Heerwagen, Statistische Unters, ueber Traume und Schlaf.
Henke, Hypothese uber den Schlaf, Z. F. R. Med. Bd. XIV.
Hennings, J. Ch. Von den Traumen.
Heubel, Abhängigkeit des wachen Gehirnzustandes von ausseren Erregungch, Pflüger's Arch. XIV. 1877.
Hildebrandt, Der Traum.
Hill, The Physiology and Pathology of Cerebral Circulation.
Holland, Henry, Chapters in Mental Physiology.
Horwath, Betr. z. Lehre uber den Wintersclaf, Verh. d. phs. medes. Würzburg. 1878.
Howell, A Contribution to the Theory of Sleep, J. of Exp. Med. 1897.
Hughlings, Jackson, Med. Times and Gazette. Dec. 6, 1862.
Jacoby, Falling Asleep while at Work, N. Y. Med. Rec. 1890.
James, Psychology, V. I.
Jamieson, Edinburgh Med. Jour. July, 1871.
Kircher, A, Ars magica.
Kirchoff, Psychiatrie.
Kohlschütter, Mechanik des Schlafes, Z. f. rat. Med. 1869.
Messungen der Festigkeit des Schlafes. 1862.
Kulpe, Outlines of Psychology.
Kussmaul and Teuner, Molesch. Untersuch. 1857.
Lajoux, Découverte de la cause du sommeil naturel.

LAMACK, Quelques cas de narcolepsie, Rev. des Med. 1897.
LANDOIS, Test Book of Physiology.
LANGLET, Physiologie du sommeil.
LASEGUE, L'appetit du sommeil, Gaz. de Hop. January, 1882.
LAUHSEN, Schlaf & Schlaflosigkeit, Berl. kl. Woch. 1897.
LEGRAND, Un cas de narcolepsie, France Med. 1888.
LEHMAN, Die Korpelichen Aeusserungen Psychischer Zustande.
LEVIE, Somnolence, Arch. Gen. de Med. 1896.
LEWES, Physiology of Common Life.
LIEBAULT, Streifzuge in das Gebiet der Passiven Zustande, des Schelfes und des Träume Z. J. Hyp. 1893.
LOMBARD, Varieties of the Normal Knee Jerk, Am. J. of Ps. 1887.
LONEY, D. W., An Obscure Case, Med. Record. June, 1888.
LORAND, Myxoedema & maladie du sommeil, Presse Medicale. 1905.
MACARIO, Du sommeil.
MACCORMACK, A Case of Narcolepsy, Brain. 1889.
MACFARLANE, Dreaming.
MACKOWITZ, V., Z. Kasuistic der Schlaftrunkenheit, Arch. f. Krim. Anthropol. 1903.
MACNISH, Philosophy of Sleep.
MADDEN, T. M., On Lethargy or Trance, Dublin J. of Med. Sc. 1881.
MAILLARD, Etude sur le sommeil.
MAKENZIE, Circulation of the Blood during Sleep, J. of M. Sc. 1891.
MANACEINE, Son kak tret zhisni tsheloveka.
Manaceine, Le sommeil.
MARDUEL, Note sur un cas de maladie du sommeil, Lyon Med. 1872.
MARSHAL HALL, Practical Observations and Suggestions in Medicine.
MARTIN, L. DE ST., Influence du sommeil, C. R. Ac. des Sc. 1888.
MATAS, Morbid Somnolence, New Orleans Med. and Surg. J. January, 1884.
MAURY, Le sommeil.
MAUTHNER, Pathologie u. Physiologie des Schlafes., W. Med. Woch. 1890.

Mays, Ueber die Bewegungen des Menscl, Gehirns, Virchow's Arch. Bd. 88.
Mendel, Ueber Anfalle von Einsclafen, Lyon Med. 1872.
Michelson, Unters. uber die Tiefe des Schlafes, Psych Arb. II. 1897.
Michelson, Die Tiefe des Schlafes.
Moll, Der Hypnotismus.
Monninghoff u. Piesbergen, Messungen ueber die Tiefe des Sclafes, Z. f. Biologie. 1883.
Moore, C. A., On Going to Sleep.
Morgan, Sir T. C., Sketches of the Philosophy of Life.
Mortimer, Granville, Sleep and Sleeplessness.
Mosso, Fear.
Sulla circulazione del sangue nel cervello. 1880.
Muller, J. Handbuch der Physiologie.
Mumford, Waking, Sleeping and Dreaming.
Myers, Human Personality.
Nicard, Le sommeil normal.
Obersteiner, Zur Theorie des Schlafes, Z. f. Psychiatrie. 1872.
Oppenheim, Lehrbuch der Nervenkrankheiten.
Oppenheimer, Physiologie des Schlafes, Du Bois' Archiv. 1902.
Parish, E., Ueber die Trugwahrnehmung.
Parmentier, De la Forme Narcoleptique, Arch. Gen. de Med. 1891.
Patrick and Gilbert, On the Effects of Loss of Sleep, Psych. Rev. III.
Pettenkofer u Voit, Ueber die Kohlensäurausscheidung und Sauerstoffaufnahme während des Wachens und Schlafens, Sitzb. d. Kngl. Ak. d. Wiss. zu München. 1866–67.
Pflüger, Theorie des Schlafes, Arch. f. Phys. V. 10. 1875.
Pictet, A., Obs. sur le sommeil chez les insects, Arch. de Ps. 1904.
Pilecz, Ueber die psych. Erscheinungen des Schlafes, W. Med. Woch. 1891.
Playfair, On Sleep, North. J. of Med. 1844.
Popov, M. N., K patologii Bessonitzi, Archiv. Psychiat. 1897.
Porter, K. H., Narcolepsy.
Kraepelin, Psychiatrie.

PREYER, Ueber eine Wirkung der Angst bei Thieren, C. f. Med. Wiss. 1873.
Die Cataplexie und der thierisce Hypnotismus.
Ueber die Ursache des Schlafes. 1877.
PREVOST, Sur le sommeil.
PRINCE, MORTON, The Dissociation of Personality.
PUPIN, Le Neurone.
PURKINJE, Wagner's Handwörterbuch der Physiologie. III. 1846.
RACHEL, Tissue-Metamorphosis and Sleep, Med. Record. 1883.
RADESTOCK, Schlaf und Traum.
RAY, Mental Hygiene.
RAYNER, H., Sleep in Relation to Narcotics, J. M. Sc. July, 1902.
REGIS, Mental Medicine.
RENAUDIN, Sur l'Influence Pathologique de l'Insomnie, Annals Medico Psychologiques T. III.
RICH, B., Ueber den Physiologischen und pathologiachen Schlaf.
RICHARDSON, The Phenomena of Sleep.
ROBERT, Der Traum.
ROSENBAUM, Warum mussen wir schlafen? 1892.
ROUSSEAU, Observ. de narcolepsie, Encephale. 1881.
RUMMO, E. FERRANINI, La circulation du sang dans le cerveu del homme pendant le sommeil.
SAHLMEN, Ein fall von Schlafsucht, Berl. kil. Wochensch. 1881.
SAJO. Der Schlaf der Insekten, Prometheos VII. 1896.
SALMON, A. Sull origene del sono. 1905.
SCHLEICH, Die Neuroglia u. ihre Beziehung z. Schlaf, Z. f. päd. Ps. 1904.
SCHOLZ, Sleep and Dream.
SERGUEYEFF, Physiologie de la veille et du sommeil.
SIDIS, B., The Psychology of Suggestion.
Psychopathological Researches.
Multiple Personality.
Studies in Psychopathology, B. Med. and S. J. March, 1907.
Hallucinations, Psych. Review. 1904.
SHERRINGTON, The Integrative Action of the Nervous System, Rep. Br. Assoc. for the Adv. of Science. 1904.
SIMPSON, The sleep of Molluscs, Pop. Sc. Monthl. I. 1894.

Skerrit and Stewart, A Case of Potracted Sleep, Br. Med. J. 1898.
Soca, Sommeil, Nouv. Ic. de la Salp. 1900.
Sollier, Genese et Nature de l'Hysterie. 1897.
Sommer, Neue Theorie des Schlafes, Z. f. rat. Med. 1868.
Soukhanoff, S., A Case of Pathological Sleep, The J. of Men. Patholo. October, 1902.
Spitta, Schlaf und Traumzustande.
Stefanowska, Examen du cerveau de souris endormis, J. de N. 1900.
Storring, G., Vorlesungen ueber Psychopathologie.
Stout, Manual of Psychology.
Strumpell, Beiträge z. Theorie des Sclafes. XV.
Szczypiorsky, Plusieurs attaques de sommeil paradoxal chez un aliene, Annales Med. Psych. November, 1891.
Tarchanoff, Obs. sur le sommeil normal, Arch. ital de Biol. 1894.
Tchish, Eksperim, iscledovanie vnimania vo vremia sna, Obosr. Psych. 1896.
Tschisch. Exp. sur l'attention pendant le sommeil, Rev. de Ps. 1896. Tissié, Les rêves.
Van Gieson and Sidis, Neuron Energy, Arch. of N. and Psychop. 1898.
Vaschide et Piéron, Psychologie du rêve. 1902.
L'evaluation du temps pendant le sommeil, Int. des Biol. I.
Verworn, Beitrage z. phys. des Centralnervensystem. 1898. General Physiology.
Vogt, Zur Kentniss des Wesens des Hypnotismus, Z. f. Hyp. 1895.
Vulpian, Leçons sur l'appareil vas moteur.
Wernicke, Lehrbuch der Gehirnkrankheiten
Weygandt, Beitrage z. Psych. des Traumes, Phil. Stud. XX. Beitr. z. Psych. des Schlafes. Ber. ueber d. I. Kon. f. exp. Psych. Giessen. 1904.
Wundt, Hypnotismus und Suggestion.
Outlines of Psychology.
Grundüzge der phys. Psychologie.
Wurtz, The Chemistry of Sleep, Popular Sc. Mo. 1894.
Zbinden, La crainte de l'insomnie, Arch. de Psych. II.

REVIEWS

THE BORDERLAND OF EPILEPSY. *By Sir William Gowers.*

THE consideration of this subject is based on cases related to epilepsy which Gowers has observed in his practice, and presents in an elaborated form the substance of a series of lectures given by him and published in the *Lancet* and *British Medical Journal*.

In the first chapter on Faints and Fainting, the relationship between minor epilepsy and fainting attacks is considered. Although the latter condition may be better explained by the sudden diminution in cerebral pressure from the lowered blood tension, rather than by a momentary loss of arterial blood supply, it is difficult to find a similar explanation for the sudden unconsciousness found in *petit mal*. The mechanism underlying this loss of consciousness is best explained by the theoretical assumption that there is discontinuity of conduction of nervous impulses through retraction of the neurone terminations.

The cardiac failure of syncope as seen in cases of purging, withdrawing fluid from the abdomen, etc., results from the cardiac centres of the medulla being affected through the cortical control rather than directly, and it is by this process also that strong emotional shocks affect the heart.

That there is a relation between cardiac syncope and epilepsy seems probable; and this is illustrated by the reporting of cases, in which the former condition developed into the latter. The differential diagnosis between the two maladies is discussed in connection with cases.

The second chapter, devoted to vagal and vaso-vagal attacks, deals with seizures characterized by sensory disturbances referred to the stomach, respiratory system, and the heart, often associated with a sense of disturbed consciousness and at times with a fear of impending death. If these symptoms are associated with vaso-motor disturbances, as a sense of coldness, especially of the extremities, the attack is classified as vaso-vagal. The crises may at times be associated with a mild degree of tetanoid spasm. These vagal attacks are from several minutes to half an hour in duration, develop gradually, reach a maximum and fade away.

Cases are described which seem to indicate a relationship existing between these vagal crises and epilepsy, and the author suggests for consideration that these attacks may represent an attenuated form of epilepsy in which the duration of the attack is prolonged and consequently the severity of the phenomena is diminished.

Gowers states that he has rescued this group of cases from the class designated as hysteria. They were studied purely from a clinical standpoint, however, and it would have added greatly to the interest of this question if a psychoanalylitical investigation had been resorted to before determining on their classification.

The chapter on vertigo is most carefully and fully developed and must be read to get the real value of its substance. Vertigo is the most frequently experienced subjective symptom of epileptic seizures and therefore holds an important place in the borderland of epilepsy. The character of aural vertigo is discussed in general and the relation of these attacks to epilepsy is brought out through their common features of suddenness of onset, brevity, loss of consciousness and loss of sight. Gowers believes that the occurrence of aural vertigo and epilepsy in the same individual is more frequently to be found than can be explained on the ground of coincidence; and he describes cases in which attacks of the former seem to develop into the latter condition. This development may be due to the fact that crises of vertigo which are perceived through the cortex of the brain as a result of stimuli from aural disturbance, may recur with greater and greater facility until the process becomes a purely central one or may persist independently of the aural irritation.

The position of migraine in the borderland of epilepsy is justified by many relations and among them by the fact that the two maladies are sometimes mistaken and more often their distinction is difficult.

One definite relationship between the two diseases is that they sometimes alternate, and cases are described in which migraine of early life, later gives place to epilepsy and the treatment of this latter condition caused a disappearance of the attacks but was followed by a return of the migraine.

The visual aura is of occasional occurrence in epilepsy

and is frequently met with in migraine. In the former disease, however, it is of much shorter duration and has a wider range of variety. Aphasia and numbness of the arms may occur with either, and both may be followed by headache. It is unusual, however, to have severe headache follow the transitory aura of this sort, while the prolonged aura of migraine is followed by more or less intense pain. An interesting case is reported in which the headaches did not cease when epilepsy made its appearance in later life, but became preceded by the aura of the fits which developed. The real nature of isolated prodromata may be difficult to determine in patients suffering from both epilepsy and migraine.

Somnolence may develop after migraine attacks and delirium may be found, suggestive in its nature of post epileptic deliriums. The automatic action and the hysteroid state met with after slight epileptic seizures may be ascribed to transient loss of control of the structures involved. It is conceivable that intense pain may produce a similar effect, inhibiting the controlling centres. Such a condition if more profound might produce a temporary loss of consciousness, and indeed this is sometimes found in migraine attacks.

Gowers concludes that the traces of a definite relation of migraine to epilepsy are slight. In extremely rare instances an affection may develop while the other goes on, and, as has been seen, the same premonitory disturbance may even be attached to each. But such cases are so rare as rather to emphasize the rule to which they form exceptions. When the exceptions are carefully examined they show that any relationship to epilepsy is indirect. Epilepsy develops from migraine as an indirect consequence of the effect of the intense pain and associated cerebral disturbance. The influence of this may be traced through stupor, sleep, delirium, and loss of consciousness, the definite epileptic symptoms.

The steps of the transition from one condition to another are fully illustrated by cases and the selection of cases throughout the monograph is admirably adapted to substantiate the arguments.

The work is concluded by a brief consideration of night terrors, somnambulism, half-waking, and narcolepsy.

G. A. WATERMAN.

THE RIDDLE OF PERSONALITY. *By H. Addington Bruce.* Moffat, Yard & Company, New York, 1908. pp. xiii, 247.

In "The Riddle of Personality," Mr. Bruce has contributed a volume which will be of value to those who wish to lay a foundation for the study of personality and also to those who read with only a general interest in the subject. A large part of the present work was published originally in Appleton's Magazine.

Though the author is neither a medical man nor a professional psychologist his book indicates wide and intelligent reading and a comprehensive grasp of his subject. He avoids technical phraseology and expresses himself in language which the least scientific can readily understand. He treats of the work of the psychical researcher as well as of that of the psychopathologist, showing in what respects the one supplements the other.

Discussing the nature of "Self," he touches upon the evolutionary theory of Darwin and the later investigations along psychical lines, and comes to the "still debatable phenomena," which he divides roughly into "spiritistic and hypnotic." Reviewing briefly the so-called spiritistic manifestations since the early part of the nineteenth century, he turns to hypnotism and outlines the history of its use from the time of Mesmer, making clear the varying methods employed, and the points of difference between the adherents of the Nancy school and those of the Salpêtrière. It is to be regretted that the author confuses, in his terminology at least, hypnotism with suggestion, a confusion which is common in popular language and medical literature. He speaks of various cases as having been cured by hypnotism, a phrase which tends to perpetuate an erroneous conception of psychotherapeutics and to do harm. By the use of hypnotism the cause of psychical illness may often be discovered, but the cure is always effected by suggestion or some form of education.

Considerable space is devoted to the work of the Society for Psychical Research and F. W. H. Myers' theory of the subliminal self is clearly explained. In this subliminal self the author, applying the theory of universal or multiple telepathy, finds an explanation of the so-called spiritistic manifestations of mediums like Mrs. Piper, which to some minds can be accounted for only by spiritism. Telepathy he calls the "Nemesis"

of spiritism and, while admitting the absence of scientific proof, says: ". . . . it is the writer's conviction that once the psychologists, as a body, seriously attack the problem of apparitions and auditions, the case for telepathy as against spiritism will be definitely proved." To the mind of the scientific reader the theory of universal telepathy is quite as difficult to accept as that of spiritism. While we agree with the author in rejecting the latter we still believe that Dr. Hodgson, Dr. Hyslop and Professor Lodge are right in rejecting the telepathic hypothesis as inadequate to explain these phenomena. That telepathy has ever occurred yet awaits proof by experimental methods and remains only a working hypothesis.

The writer attempts no explanation of multiple personality except in so far as he applies to it the law of dissociation or "the much debated theory of neuron motility," and it is perhaps as well that he does not, as even the explanations of the most skilled neurologist or psychopathologist seem somewhat inadequate to one who has experienced a dissociation of personality, as has the writer of this review. To thoroughly appreciate the intricacies of such a life a man must live it himself and get what comfort he can from the fact that he has a knowledge of the subject to be obtained in no other way.

A chapter is devoted to the "American Explorers of the Subconscious," in which tribute is paid to the work which has been done in psychotherapeutics by Dr. Morton Prince and Dr. Boris Sidis, and some of their cases cited.

The book is well written, instructive and entertaining. A bibliography is given which will be of service to those who wish for further and deeper reading.

X. Y. Z.

THE CENESTHOPATHIES (LES CENESTHOPATHIES), *By Ernest Dupre and Paul Camus.* L' Encéphale, No. 12, Dec. 1907; pp. 616-631.

UNDER the heading of cenesthopathies, Dupre and Camus group the alterations of common or internal sensibility, that is to say the disturbances of those sensations which keep streaming to the brain from all parts of the body and which, in the normal state, do not impress themselves upon our attention by any peculiarity, either in their form or their intensity.

The cenesthopath suffers above all from disturbances of this internal sensibility and presents, secondarily to these disturbances, reactions of a variable nature, determined by individual tendencies. These reactions, by their intensity, may mask the primary syndrome and give to the sufferer the appearance of an *anxieux*, a hypochondriac, a psychasthenic or even of a genuine lunatic.

The authors report six cases presenting chronic cenesthopathic disturbances of varied form and seat, but fixed and persistent in the individual, independent of all tangible lesion and rebellious to physical, medicinal and psychic treatment.

Of these six cases the following may be taken as the type:

M —— 48 years of age, Israelite, of a high intellectual level. He is the only son of a nervous mother, and in childhood was healthy and of a lively disposition. He is married and has a son who is in good health but is a neuropath. No syphilis.

At twenty the patient had serious digestive troubles, with frequent and dramatic crises of neuropathic angina pectoris.

At thirty there were added to the digestive troubles and the precordial distress, a long list of symptoms, called neurasthenic.

The treatment had been of the most varied sort, including a sojourn of seven months in a *maison de santé*, from which the patient emerged worse than before.

When first seen by the authors, in 1903, the cenesthetic troubles hold the foreground of the morbid picture. These are numerous, tenacious and diffuse, but preponderate in the cephalic, cervical and superior thoracic spheres. They consist of indefinable and annoying sensations.

The patient's brain seems to him as though atrophied, flattened, like a sponge. "I can no longer feel my brain; I feel as if I couldn't think; it's like an emptiness; I no longer feel as though I were alive." The mouth and pharynx seem to be insensible. The patient thrusts out his tongue, bites and pinches himself, grimaces incessantly and beats his head with his fist in a vain endeavor to arouse his lost feeling. The palate and nose are at the same time insensible and painful. The patient complains of not being able to feel them, yet, in the same breath, groans at the horrible distress they cause him. He no longer feels the air passing through his respiratory tract. He snuffles frequently and swallows air and salvia with deglutitory efforts so violent as to produce spasm of the œsophagus. He introduces his fingers into his mouth, touches the wall of the pharynx, and declares anxiously that he no longer feels the contact — that all feeling is abolished. He no longer feels food; he no longer feels his chest and stomach. With his eyes closed, he no longer has any notion of the position of his limbs.

He pinches and pricks himself, and digs his nails into his face and limbs to try to feel himself. "I feel myself less and less," he laments. "I should be glad to have severe pain, such as I had formerly; then, at least, I was able to feel myself; now I no longer feel anything. It is horrible! It is like a great emptiness. I am tortured by a perpetual anguish."

He hears everything that goes on about him, but can no longer, he says, tell the direction of a sound or localize noises in space. He sees and distinguishes objects, but often sees them either enlarged or reduced. At times he has certain visual illusions which he claims to be true hallucinations.

In spite of all these distressing troubles, accompanied as they are by tremendous anguish of mind, the memory, judgment, association of ideas, moral sensibility and affectivity are intact.

The memory for representation, however, presents certain disturbances; the patient seems to have lost the mental vision; he can no longer represent to himself a person or an object familiar to him. He is able to recollect things in minutest detail, but no longer experiences the satisfaction of being able to conjure up mental images of them. He is thoroughly aware of his morbid state, knows that all he suffers comes from trouble with his brain, but declares that this insight makes matters all

the worse, since he feels that nothing can be done for him. He has thoughts of suicide, but hopes on, consulting everybody and trying all the therapeutic measures suggested.

The most searching physical examination reveals nothing objectively abnormal in the nervous system or elsewhere. Since 1903 the patient's condition has not changed in any way.

The remaining five cases present numerous variations of the cenesthopathic syndrome. As shown by these cases, the seat of the disturbance of sensibility itself varies in a most interesting way. It may be bucco-pharyngeal, cephalic, thoracic, abdominal, melalgic, hemiplegic or cutaneous. There are furthermore variations in intensity and modality, in evolution and, finally, in the secondary reactions, peculiar to the individual sufferer.

At times the complaint is that the head, the various organs or the limbs are no longer felt as formerly; at others that the different parts of the body are modified in their density, their volume, their form or their relations. According to the case, these parts are elongated or shortened, too heavy or too light, deformed or displaced; the temperature of them is modified, their functions arrested or perverted.

The sensations experienced are always spoken of as strange and indefinable; annoying rather than actually painful. The fixity of their topographic localization is remarkable, and constitutes for the authors, one of the most important attributes of the cenesthopathies.

From the neurasthenic and the hysteric, the cenesthopath appears to be distinguished by the fact that he does not present the pains and topoalgias common to the hystero-neurasthenic syndrome. His sensations are always annoying and uncomfortable, never painful.

That the cenesthopath is not identical with the hypochondriac, is proven to the authors by the fact that he does not construct pathologic systems and attempt medical explanations of his sensory disturbances; furthermore he, unlike the hypochondriac, does not assume an extra-natural origin of his woes. He never experiences either the despair or the resignation of the hypochondriac; on the contrary he lives on in the constant hope of a cure or an amelioration. In spite of all his troubles he retains his affective and social activity. He never acquires delusions of negation, enormity, immortality or grandeur.

The cenesthopath is a congenital defective, the victim of constitutional unbalance, and his defect predominates in the sphere of sensation. He is, in a word, a sensory deviate, but not the victim of a true psychosis. Nosologically he belongs, in the opinion of Dupré and Camus, in a class bordering on but distinct from that of the hypochondriac.

In the reviewer's opinion the cenesthopathic syndrome represents merely a certain stage in the disaggregation of the personality, and its pathologic substratum is identical with that of the disturbances we speak of clinically as neurasthenia, hysteria, epilepsy and psychasthenia. If further experience demonstrates that the term "cenesthopathies" really represents a true clinical entity, Dupré and Camus are to be congratulated for bringing such an entity to our attention. There is on the part of psychiatrists and neurologists a constantly growing recognition of the fact that the process of disaggregation of the personality may cease abruptly at any one of a fairly large number of stages and, in so doing, give rise to a clinical syndrome peculiar to this stage, which is constant and permanent. The study of these various syndromes, particularly from the point of view of prognosis and treatment, seems to the reviewer of paramount importance. It is from this point of view that the work of Dupré and Camus possesses special merit.

J. W. COURTNEY.

STUDIES IN DEMENTIA. *By Wm. McDonald, Jr., M. D., Clinical Director, Butler Hospital, Providence, R. I.*

Through the courtesy of the author we are enabled to present an abstract of his unpublished monograph upon dementia, based upon the study of 127 individuals, 14 being normal and 113 of unsound mind. It has seemed to Dr. McDonald that the term dementia needs a more careful delimitation, in so far as its application to various terminal mental states is concerned; for although we are quick to apply the word to a variety of degenerative processes, we are not always clear as to the precise concrete connotation of our abstract description. With many patients we may claim to be able to see at a glance that they are demented, but it is by no means always easy to elucidate our grounds for saying so. In the present investigation an attempt has been made to supersede the usual passive observation of patients by an active study of them.

The arousal of interest, feeling, desire and active attention was shown to be the means by which dormant functions were led to exhibit themselves; and throughout the question held constantly in mind has been. What is dementia?

In the endeavor to answer this question resort has been made to the system of averages. A series of tests was formulated, the results of which with each individual were given a numerical value; these values were then added and an attempt was made to determine roughly, by a numerical measure, the general capacity of each person tested. For the establishment of a normal average, healthy individuals of different stations and ages were subjected to the same examination. Although the selection of the tests was not always the wisest possible, and although, as the author observes, there are many features of the method which are deserving of adverse critisism, nevertheless a number of conclusions valuable for diagnosis, and perhaps for treatment, were established.

We cannot here enter upon a description of the large number of painstaking tests upon which Dr. McDonald bases his conclusions. The exigencies of space compel us to confine ourselves to his conclusions. The clinical conditions most particularly under observation were dementia præcox, senile dementia and paretic dementia. The latter two terms are sufficiently explanatory as to the cases they comprehend, while in the dementia præcox group the author includes that great number of patients who, though sharply differentiated from senile and paretic dementia, have arrived prematurely at that physical and mental decadence to which the name dementia has been universally applied.

In the dementia præcox group some interesting and indeed surprising results were obtained. Two tests only disclosed evidence of primary defect in the essentially intellectual functions. Both of these tests had reference to the formation of associations between individual concepts of a series, and particularly to associations in an order the reverse of the most obvious and constant: e. g., series represented by the names of the months of the year, days of the week or series of numerals. The ability to recall these series in the reverse order was found to be impaired in all varieties of defect psychoses, and appeared to be a primary defect not dependent upon deficient interest or

lack of desire for endeavor. Visual impressionability, auditory receptivity, discrimination, recognition, active attention and the other intellectual processes tested were found to be *per se* not primarily deficient. What then is the defect in dementia præcox? The author answers, the loss of emotional activity. The absence of all desire, of interest, of pleasure or pain and of affective reaction, directly influences the degree of effort and voluntary attention expended. There is a clogging or blunting of feeling and a consequent absence of spontaneity and vivacity of response, together with a substitution of laziness, carelessness and apathy. This diminution of emotional tension we find to be the hall-mark of dementia præcox, and with this as a basis it is possible to explain, at least theoretically, the many clinical manifestations which characterize the disease.

To indicate briefly the distinction between the dementia of senile cases and that of dementia præcox one may say that in the former all tests emphasize the primary defect of all intellectual faculties, with comparatively well preserved affective function, as opposed to preservation of intellectual function with loss of affectibility in dementia præcox. Excepting in cases of impaired consciousness and stupor the conservation of feeling is much in evidence; and whereas sensation, impressionability, retentivity, recollection, recognition, discrimination, speed, facility and extent of association are all subnormal, with a proportional deterioration in intellectual efficiency and general productivity, the affective functions retain to a large extent their virility.

Regarding paretic dementia it may be said that any or all of the defects noted in either senile or precocious dementia, or in both, may be present according to the intensity, extent and location of the disease, but that in general the morbid process does not exert a particular selective influence upon the affective functions as in the latter psychosis. The depth of dementia occasionally attained in paresis is probaby greater than that of any other psychosis, and as a result of this living automata exist which reflexly swallow, absorb nutrition and excrete waste products like the decerebrated animals of experimental research, a depth to which no other human beings ever descend except possibly in the few brief hours of ante-mortem stupor.

JOHN E. DONLEY.